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### CHAPTER 14

## RADIATION CONTROL

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#### Subchapter 1

#### General Provisions

- 37.14.101 POLICY (1) Except as otherwise specifically provided, this chapter applies to all persons who receive, possess, use, transfer, own or acquire any source of radiation; provided, however, that nothing in these rules shall apply to any person to the extent such person is subject to regulation by the United States nuclear regulatory commission. Regulation by Montana of source material, byproduct material, and special nuclear material in quantities not sufficient to form a critical mass is subject to the provisions of the agreement between Montana and the United States nuclear regulatory commission and to 10 CFR Part 150 of its regulations. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.102 DEFINITIONS As used in this chapter, these terms have the definitions set forth below. Additional definitions used only in a certain subchapter will be found in that subchapter.
- (1) "Accelerator-produced material" means any material made radioactive by a particle accelerator.
  - (2) "Act" means Title 75, chapter 3, MCA.
- (3) "Agreement state" means any state with which the US nuclear regulatory commission or the US atomic energy commission has entered into an effective agreement under subsection 274b. of the Atomic Energy Act of 1954, as amended (73 Stat. 689).
- (4) "Airborne radioactive material" means any radioactive material dispersed in the air in the forms of dusts, fumes, mists, vapors, or gases.
  - (5) "Airborne radioactivity area" means:
- (a) any room, enclosure, or operating area in which airborne radioactive material exists in concentrations in excess of the amounts specified in Appendix A, Table I, Column 1, of subchapter 7; or
- (b) any room, enclosure, or operating area in which airborne radioactive material exists in concentrations which, averaged over the number of hours in any week during which individuals are in the area, exceed 25% of the amounts specified in Appendix A, Table I, Column 1 of subchapter 7.

- (6) "Byproduct material" means a radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.
- (7) "Calendar quarter" means not less than 12 consecutive weeks nor more than 14 consecutive weeks. The first calendar quarter of each year shall begin in January and subsequent calendar quarters shall be so arranged such that no day is included in more than 1 calendar quarter and no day in any 1 year is omitted from inclusion within a calendar quarter. No licensee or registrant shall change the method observed by him of determining calendar quarters for purposes of these rules except at the beginning of a calendar year.
  - (8) "CFR" means code of federal regulations.
- (9) "Curie" means a unit of measurement of radioactivity. One curie (Ci) is that quantity of radioactive material which decays at the rate of 3.7 x  $10^{10}$  disintegrations per second (dps). Commonly used submultiples of the curie are the millicurie and the microcurie. One millicurie (mCi)=0.001 curie=3.7 x  $10^{7}$  dps. One microcurie (:Ci)=0.000001 curie=3.7 x  $10^{4}$  dps.
- (10) "Department" means the department of public health and human services.
- (11) "Depleted uranium" means the source material uranium in which the isotope uranium-235 is less than 0.711 weight percent of the total uranium present. Depleted uranium does not include special nuclear material.
- (12) "Dose" as used in this chapter means absorbed dose or dose equivalent as appropriate.
- (a) "Absorbed dose" is the energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The special unit of absorbed dose is the rad.
- (b) "Dose equivalent" is a quantity that expresses on a common scale for all radiation a measure of the postulated effect on a given organ. It is defined as the absorbed dose in rads times certain modifying factors. The unit of dose equivalent is the rem.
- (13) "Dose commitment" means the total radiation dose to a part of the body that will result from retention in the body of radioactive material. For purposes of estimating the dose commitment, it is assumed that from the time of intake the period of exposure to retained material will not exceed 50 years.
- (14) "Exposure" means the quotient of dQ by dm where "dQ" is the absolute value of the total charge of the ions of 1 sign produced in air when all the electrons (negatrons and positrons) liberated by photons in a volume element of air having mass "dm" are completely stopped in air.

- (15) "Exposure rate" means the exposure per unit of time, such as Roentgen (R) per minute and mR per hour.
- (16) "Former United States atomic energy commission (AEC) or United States nuclear regulatory commission (NRC) licensed facilities" means nuclear reactors, nuclear fuel reprocessing plants, uranium enrichment plants, or critical mass experimental facilities where AEC or NRC licenses have been terminated.
- (17) "Healing arts" means diagnostic and/or healing treatment of human and animal maladies including but not limited to the following which are duly licensed by the state of Montana for the lawful practice of: medicine and its associated specialties, dentistry, veterinary medicine, osteopathy, chiropractic, and podiatry.
- (18) "High radiation area" means any area, accessible to individuals, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 100 millirems.
- (19) "Human use" means the internal or external administration of radiation or radioactive material to human beings.
  - (20) "Individual" means any human being.
- (21) "Inspection" means an official examination or observation including but not limited to, tests, surveys, and monitoring to determine compliance with rules, regulations, orders, requirements and conditions of the department.
- (22) "License" means a license issued by the department in accordance with the rules adopted by the department.
- (23) "Licensee" means any person who is licensed by the department in accordance with these rules and the act.
- (24) "Licensing state" means any state with regulations equivalent to the suggested state regulations for control of radiation relating to, and an effective program for, the regulatory control of NARM.
- (25) "Major processor" means a user processing, handling, or manufacturing radioactive material exceeding Type A quantities as unsealed sources or material, or exceeding 4 times Type B quantities as sealed sources, but does not include nuclear medicine programs, universities, industrial radiographers or small industrial programs. Type A quantity and Type B quantity is a quantity of radioactive material the aggregate radioactivity of which does not exceed that specified in the following table:

Transport Groups (see Table A)	Type A Quantity (in curies)	Type B Quantity (in curies)
I	0.001	20
II	0.05	20
III	3	200
IV	20	5,000
V	20	50,000
VI and VII	1,000	5,000
Special form	20*	5,000

\*Except that for californium-252, the limit is 2 Ci.

- (26) "NARM" means any naturally occurring or acceleratorproduced radioactive material except source material.
- "Natural radioactivity" means radioactivity of naturally occurring nuclides.
- (28)"Occupational dose" means exposure of an individual to radiation:
  - in a restricted area; or
- in the course of employment in which the individual's exposure to radiation; provided, involve occupational dose shall not be deemed to include any exposure of an individual to radiation for the purpose of diagnosis or therapy of such individual.
- (29)"Ore refineries" means all processors of radioactive material ore.
- "Particle accelerator" means any machine capable of accelerating electrons, protons, deuterons, or other charged particles in a vacuum and of discharging the resultant particulate or other radiation into a medium at energies usually in excess of 1 MeV.
- "Person" means "any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, agency, political subdivision or agency thereof, and any legal successor, representative, agent or agency of the foregoing, other than the United States nuclear regulatory commission, any successor thereto, or federal agencies licensed by the nuclear regulatory commission."
- (32) "Personnel monitoring equipment" means devices (e.g., film badges, pocket dosimeters, and thermoluminescent dosimeters) designed to be worn or carried by an individual for the purpose of estimating the dose received by the individual.

- (33) "Pharmacist" means an individual licensed by this state to compound and dispense drugs, prescriptions, and poisons.
- (34) "Physician" means a duly licensed physician authorized to dispense drugs in the practice of medicine in Montana.
- (35) "Rad" means the special unit of absorbed dose. One rad equals one hundredth of a joule per kilogram of material; for example, if tissue is the material of interest, then 1 rad equals 100 ergs per gram of tissue.
- (36) "Radiation" means ionizing radiation, i.e., gamma rays and x-rays, alpha and beta particles, high speed electrons, neutrons, and other nuclear particles.
- (37) "Radiation area" means any area, accessible to individuals, in which there exists radiation at such levels that a major portion of the body could receive in any 1 hour a dose in excess of 5 millirems, or in any 5 consecutive days a dose in excess of 100 millirems.
- (38) "Radiation machine" means any device capable of producing radiation except those which produce radiation only from radioactive material.
- (39) "Radiation safety officer" means one who has the knowledge and responsibility to apply appropriate radiation protection regulations.
- (40) "Radioactive material" means any material (solid, liquid, or gas) which emits radiation spontaneously.
- (41) "Radioactivity" means the disintegration of unstable atomic nuclei by the emission of radiation.
- (42) "Registrant" means any person who is registered with the department and is legally obligated to register with the department pursuant to this chapter and the act.
- (43) "Registration" means "the registering with the department by the legal owner, user, or authorized representative of sources of ionizing radiation in the manner prescribed by rule."
- (44) "Regulations of the US department of transportation" means the regulations in 49 CFR Parts 100-189.
- (45) "Rem" means a measure of the dose of any radiation to body tissue in terms of its estimated biological effect relative to a dose received from an exposure to 1 roentgen (R) of x-rays. (1 millirem (mrem)=0.001 rem) For the purpose of this chapter, any of the following is considered to be equivalent to a dose of 1 rem:
  - (a) An exposure of 1 R of X, or gamma radiation.
  - (b) A dose of 1 rad due to X, gamma, or beta radiation.
- (c) A dose of 0.05 rad due to particles heavier than protons and with sufficient energy to reach the lens of the eye.
- (d) A dose of 0.1 rad due to neutrons or high energy protons.

(i) If it is more convenient to measure the neutron flux, or equivalent, than to determine the neutron absorbed dose in rads, 1 rem of neutron radiation may, for purposes of this chapter, be assumed to be equivalent to 14 million neutrons per square centimeter incident upon the body; or if there exists sufficient information to estimate with reasonable accuracy the approximate distribution in energy of the neutrons, the incident number of neutrons per square centimeter equivalent to 1 rem may be estimated from the following table:

				Ne	eut	cro	on	Flux	x I	Dose	Εq	ui	va	le	nt	s								
Number of neutrons Average flux density																								
Neutron			ре	er	s	qua	are	e cei	nt:	imete	er				to	d	el	iv	er	1	00			
energy			fo	or	а	do	se	e equ	uiv	<i>r</i> aler	nt				mi	11	ir	em	S	in	4	0		
(MeV)			of	= 1	Lэ	cer	n								ho	ur	S	(n	eu	tr	on	s/	cm	2
			( r	ıeı	ıtı	cor	ıs	$/  \mathrm{cm}^2)$						7	oe:	rs	sec	cor	nd)	)				
Thermal								970	Х	10 <sup>6</sup>														670
0.0001								720	Х	10 <sup>6</sup>														500
0.005 .								820	Х	10 <sup>6</sup>														570
0.02 .								400	Х	10 <sup>6</sup>														280
0.1								120	Х	10 <sup>6</sup>														80
0.5			•					43	Х	10 <sup>6</sup>										•				30
1.0			•					26	Х	10 <sup>6</sup>										•				18
2.5			•					29	Х	10 <sup>6</sup>										•				20
5.0			•					26	Х	10 <sup>6</sup>										•				18
7.5			•					24	Х	10 <sup>6</sup>										•				17
10.0 .			•					24	Х	10 <sup>6</sup>										•				17
10 to 3	0							14	Х	10 <sup>6</sup>														10

- "Research and development" means theoretical analysis, exploration, or experimentation; or the extension of investigative findings and theories of a scientific or technical into practical application for experimental demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, Research and development does not include the processes. internal or external administration of radiation or radioactive material to human beings.
- "Restricted area" (controlled area) means any area access to which is controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive material. "Restricted area" shall not include any areas used for residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.
- "Roentgen" (R) means the special unit of exposure. One roentgen equals  $2.58 \times 10^{-4}$  coulombs/kilogram of air.

- (49) "Sealed source" means radioactive material that is permanently bonded or fixed in a capsule or matrix designed to prevent release and dispersal of the radioactive material under the most severe conditions which are likely to be encountered in normal use and handling.
- (50) "Source material" means uranium, thorium, or any other material which the department or the United States nuclear regulatory commission declares by order to be source material or ores containing 1 or more of the foregoing materials in such concentration as the department or the nuclear regulatory commission declares by order to be source material after the nuclear regulatory commission has determined the material in such concentration to be source material.
- (51) "Source of radiation" means any radioactive material, or any device or equipment emitting or capable of producing radiation.
- (52) "Special form" means any of the following physical forms of licensed material of any transport group:
- (a) The material is in solid form having no dimension less than 0.5 millimeter or at least 1 dimension greater than 5 millimeters; does not melt, sublime, or ignite in air at a temperature of 1,000°F; will not shatter or crumble if subjected to the percussion test described in Table B of this subchapter; and is not dissolved or converted into dispersible form to the extent of more than 0.005% by weight by immersion for 1 week in water at 68°F or in air at 86°F.
- (b) The material is securely contained in a capsule having no dimension less than 0.5 millimeter or at least 1 dimension greater than 5 millimeters, which will retain its contents if subjected to the tests prescribed in Appendix B of this subchapter and which is constructed of materials which do not melt, sublime, or ignite in air at 1,475°F, and do not dissolve or convert into dispersible form to the extent of more than 0.005% by weight by immersion for 1 week in water at 68°F or in air at 86°F.
- "Special nuclear material in quantities not sufficient to form a critical mass" means uranium enriched in the isotope U-235 in quantities not exceeding 350 grams of contained U-235; uranium-233 in quantities not exceeding 200 grams; plutonium in quantities not exceeding 200 grams; or any combination of them in accordance with the following formula: For each kind of special nuclear material, determine the ratio between the quantity of that special nuclear material and the quantity specified above for the same kind of special nuclear The sum of such ratios for all of the kinds of material. special nuclear material in combination shall not exceed "1" For example, the following quantities in (i.e., unity). combination would not exceed the limitation and are within the formula:

## $\frac{175 \text{ (grams contained U-235)}}{350} + \frac{50 \text{ (grams U-233)}}{200} + \frac{50 \text{ (grams Pu)}}{200} = 1$

- (54) "Survey" means an evaluation of the production, use, release, disposal, and/or presence of sources of radiation under a specific set of conditions to determine actual or potential radiation hazards. When appropriate, such evaluation includes, but is not limited to tests, physical examination and measurements of levels of radiation or concentration of radioactive material present.
- (55) "Test" means a method for determining the characteristics of condition of sources of radiation or components thereof.
- (56) "Transport group" means any 1 of 7 groups into which radionuclides in normal form are classified, according to their toxicity and their relative potential hazard in transport, in Table A of this subchapter.
- (a) Any radionuclide not specifically listed in 1 of the groups in Table A shall be assigned to 1 of the groups in accordance with the following table:

	Radioactiv	e nair-iire	
Radionuclide	0 to 1000 days	1000 days to 10 <sup>6</sup> years	Over 10 <sup>6</sup> years
Atomic number 1-81	Group III	Group II	Group III
Atomic number 82 and over.	Group I	Group I	Group III

Radioactive half-life

- (b) For mixtures of radionuclides the following shall apply:
- (i) If the identity and respective activity of each radionuclide are known, the permissible activity of each radionuclide shall be such that the sum, for all groups present, of the ratio between the total activity for each group to the permissible activity for each group will not be greater than unity.
- (ii) If the groups of the radionuclides are known but the amount in each group cannot be reasonably determined, the mixture shall be assigned to the most restrictive group present.
- (iii) If the identity of all or some of the radionuclides cannot be reasonably determined, each of those unidentified radionuclides shall be considered as belonging to the most restrictive group which cannot be positively excluded.

- (iv) Mixtures consisting of a single radioactive decay chain where the radionuclides are in the naturally occurring proportions shall be considered as consisting of a single radionuclide. The group and activity shall be that of the first member present in the chain, except that if a radionuclide "X" has a half-life longer than that of that first member and an activity greater than that of any other member, including the first, at any time during transportation, the transport group of the nuclide "X" and the activity of the mixture shall be the maximum activity of that nuclide "X" during transportation.
- (57) "US department of energy" means the department of energy established by Public Law 95-91, August 4, 1977, 91 Stat. 565, 42 USC 7101, et seq., to the extent that the department exercises functions formerly vested in the US atomic energy commission, its chairman, its members, officers and components and transferred to the US energy research and development administration and to the administrator thereof pursuant to sections 104(b), (c) and (d) of the Energy Reorganization Act of 1974 (Public Law 93-438, October 11, 1974, 88 Stat. 1233 at 1237, effective January 19, 1975) and retransferred to the secretary of energy pursuant to section 301(a) of the Department of Energy Organization Act (Public Law 95-91, August 4, 1977, 91 Stat. 565 at 577-578, 42 USC 7151, effective October 1, 1977).
- (58) "Unrefined and unprocessed ore" means ore in its natural form prior to any processing, such as grinding, roasting, beneficiating, or refining.
- (59) "Unrestricted area" (uncontrolled area) means any area access to which is not controlled by the licensee or registrant for purposes of protection of individuals from exposure to radiation and radioactive material, and any area used for residential quarters.
- (60) "Waste handling licensees" mean persons licensed to receive and store radioactive wastes prior to disposal and/or persons licensed to dispose of radioactive waste.
- (61) "Worker" means an individual engaged in work under a license or registration issued by the department and controlled by a licensee or registrant, but does not include the licensee or registrant. (History: Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 03 through 05 reserved

- 37.14.106 EXEMPTIONS (1) The department may, upon application therefor or upon its own initiative, grant such exemptions or exceptions from the requirements of this chapter as it determines are authorized by law and will not result in undue hazard to public health and safety or property.
- (2) Common and contract carriers, freight forwarders, and warehousemen, who are subject to the rules and regulations of the US department of transportation or the US postal service (39 CFR Parts 14 and 15), are exempt from this chapter to the extent that they transport or store sources of radiation in the regular course of their carriage for another or storage incident thereto. Private carriers who are subject to the rules and regulations of the US department of transportation are exempt from this chapter to the extent that they transport sources of radiation. Common, contract, and private carriers who are not subject to the rules and regulations of the US department of transportation or the US postal service are subject to the applicable rules of this chapter.
- (3) Any US department of energy contractor subcontractor any US nuclear regulatory commission and contractor or subcontractor of the following operating within Montana is exempt from this chapter to the extent that such contractor or subcontractor under his contract receives, possesses, uses, transfers or acquires sources of radiation:
- (a) prime contractors performing work for the US department of energy at US government-owned or controlled sites, including the transportation of sources of radiation to or from such sites and the performance of contract services during temporary interruptions of such transportation;
- (b) prime contractors of the US department of energy performing research in, or development, manufacture, storage, testing or transportation of, atomic weapons or components thereof;
- (c) prime contractors of the US department of energy using or operating nuclear reactors or other nuclear devices in a United States government-owned vehicle or vessel; and
- (d) any other prime contractor or subcontractor of the US department of energy or of the US nuclear regulatory commission when the department and the nuclear regulatory commission jointly determine:
- (i) that the exemption of the prime contractor or subcontractor is authorized by law; and
- (ii) that under the terms of the contract or subcontract, there is adequate assurance that the work thereunder can be accomplished without undue risk to the public health and safety. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-104, 75-3-201 and 75-3-203, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.107 RECORDS (1) Each licensee and registrant shall maintain records showing the receipt, transfer, and disposal of all sources of radiation. Additional record requirements are specified elsewhere in this chapter. (History: Sec. 75-3-201 and 75-3-204, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.108 INSPECTIONS (1) Each licensee and registrant shall afford the department at all reasonable times opportunity to inspect sources of radiation and the premises and facilities wherein such sources of radiation are used or stored.
- (2) Each licensee and registrant shall make available to the department for inspection, upon reasonable notice, records maintained pursuant to this chapter. (History: Sec. 75-3-201 and 75-3-202, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-107, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)

Rules 09 through 14 reserved

- 37.14.115 TESTS (1) Each licensee and registrant shall perform upon instructions from the department, or shall permit the department to perform, such reasonable tests as the department deems appropriate or necessary including, but not limited to, tests of:
  - (a) sources of radiation;
- facilities wherein sources of radiation are used or (b) stored;
  - (c) radiation detection and monitoring instruments; and
- (d) other equipment and devices used in connection with utilization or storage of licensed or registered sources of radiation. (History: Sec. 75-3-201, MCA; <u>IMP</u>, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.116 PROHIBITED USES (1) No person may use handheld fluoroscopic screens or shoe-fitting fluoroscopic devices. (History: Sec. 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-204, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 17 through 19 reserved

37.14.120 COMMUNICATIONS (1) All communications and reports concerning this chapter, and applications filed thereunder, should be addressed to the Department of Public Health and Human Services, Quality Assurance Division, 2401 Colonial Drive, P.O. Box 2025953, Helena, MT 59620-5953. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### TABLE A TRANSPORT GROUPING OF RADIONUCLIDES

·		
$Element^1$	${\sf Radionuclide}^2$	Group
Actinium (89)	Ac-227	I
, ,	Ac-228	I
Americium (95)	Am-241	I
,	Am-243	I
Antimony (51)	Sb-122	IV
2 , ,	Sb-124	III
	Sb-125	III
Argon (18)	Ar-37	VI
J , ,	Ar-41	II
	Ar-41 (uncompressed) <sup>3</sup>	V
Arsenic (33)	As-73	IV
	As-74	IV
	As-76	IV
	As-77	IV
Astatine (85)	At-211	III
Barium (56)	Ba-131	IV
	Ba-133	II
	Ba-140	III
Berkelium (97)	Bk-249	I
Beryllium (4)	Be-7	IV
Bismuth (83)	Bi-206	IV
	Bi-207	III
	Bi-210	II
	Bi-212	III
Bromine (35)	Br-82	IV
Cadmium (48)	Cd-109	IV
	Cd-115 <sup>m</sup>	III
	Cd-115	IV
Calcium (20)	Ca-45	IV
	Ca-47	IV
Californium (98)	Cf-249	I
	Cf-250	I
	Cf-252	I
Carbon (6)	C-14	IV

<sup>1</sup> Atomic number shown in parentheses.

 $<sup>^{\</sup>rm 2}$  Atomic mass number shown after the element symbol.

<sup>&</sup>lt;sup>3</sup> Uncompressed means at a pressure not exceeding 1 atmosphere.

 $<sup>^{</sup>m}$  Mestastable state.

Element <sup>1</sup>	Radionuclide <sup>2</sup>	Group			
Cerium (58)	Ce-141	IV			
	Ce-143	IV			
	Ce-144	III			
Cesium (55)	Cs-131	IV			
	$Cs-134^m$	III			
	Cs-134	III			
	Cs-135	IV			
	Cs-136	IV			
	Cs-137	III			
Chlorine (17)	Cl-36	III			
	Cl-38	IV			
Chromium (24)	Cr-51	IV			
Cobalt (27)	Co-56	III			
	Co-57	IV			
	Co-58 <sup>m</sup>	IV			
	Co-58	IV			
	Co-60	III			
Copper (29)	Cu-64	VI			
Curium (96)	Cm-242	I			
	Cm-243	I			
	Cm-244	I			
	Cm-245	I			
	Cm-246	I			
Dysprosium (66)	Dy-154	III			
	Dy-165	IV			
	Dy-166	IV			
Erbium (68)	Er-169	IV			
	Er-171	IV			
Europium (63)	Eu-150	III			
	Eu-152 <sup>m</sup>	IV			
	Eu-152	III			
	Eu-154	II			
	Eu-155	IV			
Fluorine (9)	F-18	IV			
Gadolinium (64)	Gd-153	IV			
( ,	Gd-159	IV			
Gallium (31)	Ga-67	III			
( 0 - )	Ga-72	IV			
Germanium (32)	Ge-71	IV			

Atomic number shown in parentheses.
 Atomic mass number shown after the element symbol.

<sup>&</sup>lt;sup>m</sup> Mestastable state.

Element <sup>1</sup>	Radionuclide <sup>2</sup>	Group
Gold (79)	Au-193	III
	Au-194	III
	Au-195	III
	Au-196	IV
	Au-198	IV
	Au-199	IV
Hafnium (72)	Hf-181	IV
Holmiun (67)	Ho-166	IV
Hydrogen (1)	H-3 (see tritium)	
Indium (49)	$In-113^m$	IV
	$In-114^m$	III
	$In-115^m$	IV
	In-115	IV
Iodine (53)	I-124	III
	I-125	III
	I-126	III
	I-129	III
	I-131	III
	I-132	IV
	I-133	III
	I-134	IV
	I-135	IV
Iridium (77)	Ir-190	IV
	Ir-192	III
	Ir-194	IV
Iron (26)	Fe-55	IV
	Fe-59	IV
Krypton (36)	Kr-85 <sup>m</sup>	III
	$Kr-85^{m}$ (uncompressed) <sup>3</sup>	V
	Kr-85	III
	Kr-85 (uncompressed) <sup>3</sup>	VI
	Kr-87	II
	Kr-87 (uncompressed) <sup>3</sup>	V
Lanthanum (57)	La-140	IV
Lead (82)	Pb-203	IV
	Pb-210	II
	Pb-212	II

<sup>1</sup> Atomic number shown in parentheses.

Atomic mass number shown after the element symbol.
 Uncompressed means at a pressure not exceeding 1 atmosphere.

m Mestastable state.

$Element^1$	Radionuclide <sup>2</sup>	Group
Lutetium (71)	Lu-172	III
	Lu-177	IV
Magnesium (12)	Mg-28	III
Manganese (25)	Mn-52	IV
	Mn-54	IV
	Mn-56	IV
Mercury (80)	Hg-197™	IV
2 . ,	Hg-197	IV
	Hg-203	IV
Mixed fission product	s (MFP)	II
Molybdenum (42)	Mo-99	IV
Neodymium (60)	Nd-147	IV
1.0007	Nd-149	IV
Neptunium (93)	Np-237	Ī
Nepediram (55)	Np-239	Ī
Nickel (28)	Ni-56	III
NICKCI (20)	Ni-59	IV
	Ni-63	IV
	Ni-65	IV
Niobium (41)	Nb-93 <sup>m</sup>	IV
NIODIUM (41)	Nb-95	IV
	Nb-97	IV
Osmium (76)	Os-185	IV
OSHITUH (70)	Os-105 Os-191 <sup>m</sup>	IV
	Os-191 Os-191	
	Os-191 Os-193	IV
Palladium (46)	Pd-103	IV IV
Palladium (46)	Pd-103 Pd-109	
Db		IV
Phosphorus (15)	P-32	IV
Platinum (78)	Pt-191	IV
	Pt-193	IV
	Pt-193 <sup>m</sup>	IV
	Pt-197 <sup>m</sup>	IV
77 (04)	Pt-197	IV
Plutonium (94)	Pu-238 (F)	I
	Pu-239 (F)	I
	Pu-240	I
	Pu-241 (F)	I
	Pu-242	I

<sup>1</sup> Atomic number shown in parentheses.

<sup>&</sup>lt;sup>2</sup> Atomic mass number shown after the element symbol.

 $<sup>^{\</sup>text{m}}$  Mestastable state.

<sup>(</sup>F) Fissile material.

${ t Element}^1$	Radionuclide <sup>2</sup>	Group
Polonium (84)	Po-210	I
Potassium (19)	K-42	IV
	K-43	III
Praseodymium (59)	Pr-142	IV
	Pr-143	IV
Promethium (61)	Pm-147	IV
	Pm-149	IV
Protactinium (91)	Pa-230	I
	Pa-231	I
	Pa-233	II
Radium (88)	Ra-223	II
	Ra-224	II
	Ra-226	I
	Ra-228	I
Radon (86)	Rn-220	IV
	Rn-222	II
Rhenium (75)	Re-183	IV
	Re-186	IV
	Re-187	IV
	Re-188	IV
	Re-Natural	IV
Rhodium (45)	Rh-103 <sup>m</sup>	IV
	Rh-105	IV
Rubidium (37)	Rb-86	IV
	Rb-87	IV
	Rb-Natural	IV
Ruthenium (44)	Ru-97	IV
	Ru-103	IV
	Ru-105	IV
	Ru-106	III
Samarium (62)	Sm-145	III
	Sm-147	III
	Sm-151	IV
	Sm-153	IV
Scandium (21)	Sc-46	III
	Sc-47	IV
	Sc-48	IV

<sup>1</sup> Atomic number shown in parentheses.

<sup>&</sup>lt;sup>2</sup> Atomic mass number shown after the element symbol.

<sup>&</sup>lt;sup>m</sup> Mestastable state.

#### RADIATION CONTROL

Element <sup>1</sup>	${\tt Radionuclide}^2$	Group
Selenium (34)	Se-75	IV
Silicon (14)	Si-31	IV
Silver (47)	Ag-105	IV
	$Ag-110^m$	III
	Ag-111	IV
Sodium (11)	Na-22	III
	Na-24	IV
Strontium (38)	Sr-85 <sup>m</sup>	IV
	Sr-85	IV
	Sr-89	III
	Sr-90	II
	Sr-91	III
	Sr-92	IV
	Sr-89	III
	Sr-90	II
	Sr-91	III
	Sr-92	IV
Sulfur (16)	S-35	IV
Tantalum (73)	Ta-182	III
Technetium (43)	Tc-96 <sup>m</sup>	IV
	Tc-96	IV
	Tc-97 <sup>m</sup>	IV
	Tc-97	IV
	$Tc-99^m$	IV
	Tc-99	IV
Tellurium (52)	Te-125 <sup>m</sup>	IV
	Te-127 <sup>m</sup>	IV
	Te-127	IV
	Te-129 <sup>m</sup>	III
	Te-129	IV
	Te-131 <sup>m</sup>	III
	Te-132	IV
Terbium (65)	Tb-160	III
Thallium (81)	T1-200	IV
	T1-201	IV
	T1-202	IV
	T1-204	III

<sup>&</sup>lt;sup>1</sup> Atomic number shown in parentheses. <sup>2</sup> Atomic mass number shown after the element symbol.

<sup>&</sup>lt;sup>m</sup> Mestastable state.

$Element^1$	Radionuclide <sup>2</sup>	Group
Thorium (90)	Th-227	II
	Th-228	I
	Th-230	I
	Th-231	I
	Th-232	III
	Th-234	II
	Th-Natural	III
Thulium (69)	Tm-168	III
	Tm-170	III
	Tm-171	IV
Tin (50)	Sn-113	IV
	$\operatorname{Sn-}117^{\scriptscriptstyle{\mathfrak{m}}}$	III
	Sn-121	III
	Sn-125	IV
Tritium (1)	H-3	IV
	H-3 (as a gas, as luminou	
	paint, or adsorbed on so	lid
	material)	VII
Tungsten (74)	W-181	IV
	W-185	IV
	W-187	IV
Uranium (92)	U-230	II
	U-232	I
	U-233(F)	II
	U-234	II
	U-235(F)	III
	U-236	II
	U-238	III
	U-Natural	III
	U-Enriched(F)	III
	U-Depleted .	III
Vanadium (23)	V-48	IV
, ,	V-49	III
	Y-91 <sup>m</sup>	III
	Y-91	III
	Y-92	IV
	Y-93	IV
		<del></del>

<sup>1</sup> Atomic number shown in parentheses.

<sup>&</sup>lt;sup>2</sup> Atomic mass number shown after the element symbol.

m Mestastable state.

<sup>(</sup>F) Fissile material.

#### RADIATION CONTROL

Element <sup>1</sup>	Radionuclide <sup>2</sup>	Group
Xenon (54)	Xe-125	III
	Xe-131 <sup>m</sup>	III
	$Xe-131^m$ (uncompressed) <sup>3</sup>	V
	Xe-133	III
	Xe-133 (uncompressed) <sup>3</sup>	VI
	Xe-135	II
	Xe-135 (uncompressed) <sup>3</sup>	V
Ytterbium (70)	Yb-175	IV
Yttrium (39)	Y-88	III
	Y-90 (uncompressed) <sup>3</sup>	IV
Zinc (30)	Zn-65	IV
	$Zn-69^m$	IV
	Zn-69	IV
Zirconium (40)	Zr-93	IV
	Zr-95	III
	Zr-97	IV

<sup>1</sup> Atomic number shown in parentheses.

<sup>&</sup>lt;sup>2</sup> Atomic mass number shown after the element symbol. <sup>3</sup> Uncompressed means at a pressure not exceeding 1 atmosphere.

m Mestastable state.

#### TABLE B

#### TESTS FOR SPECIAL FORM LICENSED MATERIAL

- 1. Free Drop A free drop through a distance of 30 feet onto a flat essentially unyielding horizontal surface, striking the surface in such a position as to suffer maximum damage.
- 2. Percussion Impact of the flat circular end of a 1 inch diameter steel rod weighing 3 pounds, dropped through a distance of 40 inches. The capsule or material shall be placed on a sheet of lead, of hardness number 3.5 to 4.5 on the Vickers scale, and not more than 1 inch thick, supported by a smooth essentially unyielding surface.
- 3. Heating Heating in air to a temperature of 1,475°F and remaining at that temperature for a period of 10 minutes.
- 4. Immersion Immersion for 24 hours in water at room temperature. The water shall be a pH 6 pH 8, with a maximum conductivity of 10 micromhos per centimeter.

Subchapter 2 reserved

### Subchapter 3

### Registration of Radiation Machine Facilities

- 37.14.301 PURPOSE (1) This subchapter provides for the registration of radiation machine facilities.
- (2) In addition to the requirements of this subchapter, all registrants are subject to the applicable provisions of other rules of this chapter. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.302 DEFINITIONS (1)For purposes of this subchapter "facility" means the location at which 1 or more devices or sources are installed and/or located within 1 building, vehicle, or under 1 roof and are under the same administrative control. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 03 through 05 reserved

- 37.14.306 EXEMPTIONS (1) Electronic equipment that produces radiation incidental to its operation for other purposes is exempt from the registration and notification requirements of this subchapter, providing dose equivalent rate averaged over an area of 10 square centimeters does not exceed 0.5 mrem per hour at 5 cm from any accessible surface of such equipment. The production, testing, or factory servicing or such equipment shall not be exempt.
- (2) Radiation machines while in transit or storage incident thereto are exempt from the requirements of this subchapter.
- (3) Domestic television receivers are exempt from the requirements of this subchapter. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.307 REGISTRATION (1) The owner or person having possession of any radiation machine shall:
- (a) Register such machine with the department within 30 days following the effective date of this chapter or after acquisition of such machine and prior to its use. Registration shall be on forms available from the department.
- (b) Designate an individual who will be responsible for radiation protection for the machine. Such individuals shall:
- (i) be qualified by training and experience concerning all hazards and precautions involved in operating the machine for which he is responsible;
- (ii) upon request by the department provide a detailed program of radiation safety for effective compliance with the applicable requirements of this chapter;
- (iii give instructions concerning hazards and safety practices to individuals who may be occupationally exposed to radiation from the machine; and
- (iv) make surveys and carry out other procedures as required by this chapter.
- (c) When, in the opinion of the department, the individual designated to be responsible for radiation safety does not have qualifications sufficient to insure such safety, the department may order the registrant to designate another individual who meets the requirements of this subsection.
- (2) The registrant shall notify the department within 10 days after any change which renders the information on the registration no longer accurate.
- (3) The owner or person having possession of any registered radiation machine shall re-register such machine with the department every 2 years as long as the activity requiring such registration continues.

- (4) No person, in any advertisement, shall refer to the fact that a radiation machine is registered with the department and no person shall state or imply that any activity under such registration has been approved by the department.
- (5) Whenever a manufacturer, his agent or a dealer sells or transfers title to a radiation machine, said manufacturer, his agent or the dealer shall give written notification thereof to the department. Written notification shall be given within 15 days of such sale or transfer of title and shall include the name and address of the new owner or owners.
- Whenever an owner sells, transfers title, or disposes said owner radiation machine, shall give written of notification thereof the department. This written to notification shall be given within 15 days of such sale, transfer of title, or disposal, and shall include the name and address of the owner and details of the final disposal of the machine. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 08 through 14 reserved

- 37.14.315 OUT-OF-STATE RADIATION MACHINES (1) Whenever any radiation machine is to be brought into Montana, for any temporary use, the person proposing to bring such machine into Montana shall give written notice to the department at least 2 working days before such machine is to be used in Montana. notice shall include:
  - the type of radiation machine;
  - the nature, duration, and scope of use; and (b)
- (C) the exact location(s) where the radiation machine is to be used.
- (2) If, for a specific case, the 2 working-day period would impose an undue hardship on the person, upon application to the department, permission to proceed sooner may be granted.
  - The person referred to in (1) of this rule shall:
  - (a) comply with all applicable rules of the department;
- supply the department with such other information as (b) the department may reasonably request; and
- not operate within Montana on a temporary basis in excess of 180 calendar days per year. (History: Sec. 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-202, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEO, 2000 MAR p. 189.)

Subchapter 4 reserved

### Subchapter 5

### Licensing of Radioactive Material

- 37.14.501 PURPOSE (1) This subchapter provides for the licensing of radioactive material. No person shall receive, possess, use, transfer, or acquire radioactive material except as authorized in a specific or general license issued pursuant to this subchapter or as otherwise provided in this subchapter.
- (2) In addition to the requirements of this subchapter, all licensees are subject to the requirements of ARM Title 37, chapter 14, subchapters 1, 7 and 17. Licensees engaged in industrial radiographic operations are subject to the requirements of ARM Title 37, chapter 14, subchapter 8, and licensees using sealed sources in the healing arts are subject to the requirements of ARM Title 37, chapter 14, subchapter 11. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202 and 75-3-404, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 02 through 04 reserved

- 37.14.505 EXEMPTIONS: SOURCE MATERIAL (1) Any person is exempt from this subchapter to the extent that such person receives, possesses, uses, or transfers source material in any chemical mixture, compound, solution, or alloy in which the source material is by weight less than 1/20 of 1% (0.05%) of the mixture, compound, solution, or alloy.
- (2) Any person is exempt from this subchapter to the extent that such person receives, possesses, uses, or transfers unrefined and unprocessed ore containing source material; provided that, except as authorized in a specific license, such person shall not refine or process such ore.
- (3) Any person is exempt from this subchapter to the extent that such person receives, possesses, uses, or transfers:
  - (a) any quantities of thorium contained in:
  - (i) incandescent gas mantles,
  - (ii) vacuum tubes,
  - (iii) welding rods,
- (iv) electric lamps for illuminating purposes provided that each lamp does not contain more than 50 milligrams of thorium,
- (v) germicidal lamps, sunlamps, and lamps for outdoor or industrial lighting provided that each lamp does not contain more than 2 grams of thorium,
- (vi) rare earth metals and compounds, mixtures, and products containing not more than 0.25% by weight thorium, uranium, or any combination of these, or
- (vii) personnel neutron dosimeters, provided that each dosimeter does not contain more than 50 milligrams of thorium;
  - (b) source material contained in the following products:
- (i) glazed ceramic tableware, provided that the glaze contains not more than 20% by weight source material,
- (ii) glassware, glass enamel and glass enamel frit containing not more than 10% by weight source material, but not including commercially manufactured glass brick, pane glass, ceramic tile or other glass, glass enamel or ceramic used in construction, or
- (iii) piezoelectric ceramic containing not more than 2% by weight source material;

- (c) photographic film, negatives, and prints containing uranium or thorium;
- (d) any finished product or part fabricated of, or containing, tungsten-thorium or magnesium-thorium alloys, provided that the thorium content of the alloy does not exceed 4% by weight and that this exemption shall not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such product or part;
- (e) uranium contained in counterweights installed in aircraft, rockets, projectiles, and missiles, or stored or handled in connection with installation or removal of such counterweights, provided that
- (i) the counterweights are manufactured in accordance with a specific license issued by the US nuclear regulatory commission, authorizing distribution by the licensee pursuant to 10 CFR Part 40,
- (ii) each counterweight has been impressed with the following legend clearly legible through any plating or other covering: "DEPLETED URANIUM". The requirements specified in (3)(e)(ii) and (iii) of this rule need not be met by counterweights manufactured prior to December 31, 1969; provided, that such counterweights are impressed with the legend "CAUTION--RADIOACTIVE MATERIAL--URANIUM", as previously required by this chapter.
- (iii) each counterweight is durably and legibly labeled or marked with the identification of the manufacturer and the statement: "UNAUTHORIZED ALTERATIONS PROHIBITED", and
- (iv) this exemption shall not be deemed to authorize the chemical, physical, or metallurgical treatment or processing of any such counterweights other than repair or restoration of any plating or other covering;
- (f) uranium used as shielding constituting part of any shipping container which is conspicuously and legibly impressed with the legend "CAUTION--RADIOACTIVE SHIELDING--URANIUM" and which meets the specifications for containers for radioactive material prescribed in 49 CFR Part 173, section 173.394 or 173.395, of the US department of transportation regulations;
- (g) thorium contained in finished optical lenses, provided that each lens does not contain more than 30% by weight of thorium, and that this exemption shall not be deemed to authorize either:
- (i) the shaping, grinding, or polishing of such lens or manufacturing processes other than the assembly of such lens into optical systems and devices without any alteration of the lens, or
- (ii) the receipt, possession, use, or transfer of thorium contained in contact lenses, or in spectacles, or in eyepieces in binoculars or other optical instruments;

- (h) uranium contained in detector heads for use in fire detection units, provided that each detector head contains not more than 0.005 microcurie of uranium; or
- (i) thorium contained in any finished aircraft engine part containing nickel-thoria alloy, provided that
- (i) the thorium is dispersed in the nickel-thoria alloy in the form of finely divided thoria (thorium dioxide), and
- (ii) the thorium content in the nickel-thoria alloy does not exceed 4% by weight.
- (4) The exemptions in (3) of this rule do not authorize the manufacture of any of the products described. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-104 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.506 EXEMPTIONS: RADIOACTIVE MATERIAL OTHER THAN SOURCE MATERIAL (1)(a) Except as provided in (b) below, any person is exempt from this subchapter to the extent that such person receives, possesses, uses, transfers, or acquires products or materials containing radioactive material in concentrations not in excess of those listed in Schedule A of this subchapter, with the exception of radium 226 for which the exempt concentration is 5 x  $10^{-6}$  mCi/ml (u Ci/gm).
- (b) No person may introduce radioactive material into a product or material knowing or having reason to believe that it will be transferred to persons exempt under (a) above or equivalent regulations of the US nuclear regulatory commission, any agreement state or licensing state, except in accordance with a specific license issued pursuant to ARM 37.14.542(1) or the general license provided in ARM 37.14.551.
- (2)(a) Except as provided in (c) and (d) below, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers or acquires radioactive material in individual quantities each of which does not exceed the applicable quantity set forth in Schedule B of this subchapter.
- (b) ARM 37.14.506(2) does not authorize the production, packaging or repackaging of radioactive material for purposes of commercial distribution, or the incorporation of radioactive material into products intended for commercial distribution.

- of No person may, for purposes commercial distribution, transfer radioactive material in the individual quantities set forth in Schedule B of this subchapter, knowing or having reason to believe that such quantities of radioactive material will be transferred to persons exempt under (2) of this rule or equivalent regulations of the US nuclear regulatory commission, any agreement state or licensing state, except in accordance with a specific license issued by the US nuclear regulatory commission pursuant to 10 CFR Part 32, section 32.18 or by the department pursuant to ARM 37.14.542(2) which license states that the radioactive material may be transferred by the licensee to persons exempt under (2) or the equivalent regulations of the US nuclear regulatory commission, agreement state or licensing state.
- Except for persons who apply radioactive material to, persons who incorporate radioactive material into the following products, any person is exempt from this subchapter to the extent that he receives, possesses, uses, transfers, or acquires the following products: (Authority to transfer possession or control by the manufacturer, processor, producer of any equipment, device, commodity, or other product containing byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the US Nuclear Regulatory Commission, Washington, DC 20555.)
- Timepieces or hands or dials containing not more than the following specified quantities of radioactive material and not exceeding the following specified levels of radiation:
  - 25 millicuries of tritium per timepiece.
  - 5 millicuries of tritium per hand.
- (iii) 15 millicuries of tritium per dial (bezels when used shall be considered as part of the dial).
- 100 microcuries of promethium-147 per watch or 200 microcuries of promethium-147 per any other timepiece.
- (v) 20 microcuries of promethium-147 per watch hand or 40 microcuries of promethium-147 per other timepiece hand.
- 60 microcuries of promethium-147 per watch dial or 120 microcuries of promethium-147 per other timepiece dial (bezels when used shall be considered as part of the dial).
- The levels of radiation from hands and dials containing promethium-147 will not exceed, when measured through 50 milligrams per square centimeter of absorber:

- (A) For wrist watches, 0.1 millirad per hour at 10 centimeters from any surface.
- (B) For pocket watches, 0.1 millirad per hour at 1 centimeter from any surface.
- (C) For any other timepiece, 0.2 millirad per hour at 10 centimeters from any surface.
- (viii) One microcurie of radium-226 per timepiece in timepieces acquired prior to the effective date of this chapter.
- (b) Lock illuminators containing not more than 15 millicuries of tritium or not more than 2 millicuries of promethium-147 installed in automobile locks. The levels of radiation from each lock illuminator containing promethium-147 will not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 50 milligrams per square centimeter of absorber.
- (c) Precision balances containing not more than 1 millicurie of tritium per balance or not more than 0.5 millicurie of tritium per balance part.
- (d) Automobile shift quadrants containing not more than 25 millicuries of tritium.
- (e) Marine compasses containing not more than 750 millicuries of tritium gas and other marine navigational instruments containing not more than 250 millicuries of tritium gas.
- (f) Thermostat dials and pointers containing not more than 25 millicuries of tritium per thermostat.
- (g) Electron tubes; provided, that each tube does not contain more than 1 of the following specified quantities of byproduct material:
- (i) 150 millicuries of tritium per microwave receiver protector tube or 10 millicuries of tritium per any other electron tube.
  - (ii) 1 microcurie of cobalt-60.
  - (iii) 5 microcuries of nickel-63.
  - (iv) 30 microcuries of krypton-85.
  - (v) 5 microcuries of cesium-137.
  - (vi) 30 microcuries of promethium-147.

And provided further, that the levels of radiation from each electron tube containing byproduct material do not exceed 1 millirad per hour at 1 centimeter from any surface when measured through 7 milligrams per square centimeter of absorber. For purposes of (g), "electron tubes" include spark gap tubes, power tubes, gas tubes including glow lamps, receiving tubes, microwave tubes, indicator tubes, pick-up tubes, radiation detection tubes, and any other completely sealed tube that is designed to conduct or control electrical currents.

- (h) Ionizing radiation measuring instruments containing, for purposes of internal calibration or standardization, a source of radioactive material not exceeding the applicable quantity set forth in Schedule B of this subchapter.
- (i) Spark gap irradiators containing not more than 1 microcurie of cobalt-60 per spark gap irradiator for use in electrically ignited fuel oil burners having a firing rate of at least 3 gallons (11.4 liters) per hour.
- Except for persons who manufacture, process, or produce self-luminous products containing tritium, krypton-85, or promethium-147, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, or acquires tritium, krypton-85 or promethium-147 in self-luminous manufactured, processed, produced, imported, transferred in accordance with a specific license issued by the US nuclear regulatory commission pursuant to 10 CFR Part 32, section 32.22, which license authorizes the transfer of the product to persons who are exempt from regulatory requirements. The exemption in (a) does not apply to tritium, krypton-85, or promethium-147 used in products for frivolous purposes or in toys or adornments.
- (b) Any person is exempt from this chapter to the extent that such person receives, possesses, uses, or transfers articles containing less than 0.1 microcurie of radium-226 which were acquired prior to the effective date of this chapter.
- (5)(a) Except for persons who manufacture, process, or produce gas and aerosol detectors containing radioactive material, any person is exempt from this chapter to the extent that such person receives, possesses, uses, transfers, acquires radioactive material in gas and aerosol detectors designed to protect life or property from fire and airborne hazards provided that detectors containing radioactive material shall have been manufactured, imported, or transferred in accordance with a specific license issued by the US nuclear regulatory commission pursuant to 10 CFR Part 32, section 32.26; a licensing state pursuant to ARM 37.14.542(3) authorizes the transfer of the detectors to persons who are exempt from regulatory requirements. Authority to transfer possession or control by the manufacturer, processor or producer of any equipment, device, commodity, or other product containing byproduct material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the US Nuclear Regulatory Commission, Washington, DC 20555.

- (b) Gas and aerosol detectors previously manufactured and distributed to general licensees in accordance with a specific license issued by an agreement state shall be considered exempt under (a) above, provided that the device is labeled in accordance with the specific license authorizing distribution of the generally licensed device, and provided further that they meet the requirements of ARM 37.14.542(3).
- (c) Gas and aerosol detectors containing NARM previously manufactured and distributed in accordance with a specific license issued by a licensing state shall be considered exempt under (a) above, provided that the device is labeled in accordance with the specific license authorizing distribution, and provided further that they meet the requirements of ARM 37.14.542(3).
- (6) Any person is exempt from this chapter to the extent such person receives, possesses, uses, transfers, or acquires synthetic plastic resins containing scandium-46 which are designed for sand consolidation in oil wells. Such resins shall have been manufactured or imported in accordance with a specific license issued by the US nuclear regulatory commission, have been manufactured in accordance with specifications contained in a specific license issued by the department or any agreement state to the manufacturer of such resins pursuant to licensing requirements equivalent to those in 10 CFR Part 32, sections 32.16 and 32.17, of the regulations of the US nuclear regulatory commission. This exemption does not authorize the manufacture of any resins containing scandium-46. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-104 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; AMD, 1980 MAR p. 2926, Eff. 11/15/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 07 through 09 reserved

- 37.14.510 LICENSES: TYPES OF LICENSES (1) Licenses for radioactive materials are of 2 types: general and specific. General licenses provided in this subchapter are effective without the filing of applications with the department or the issuance of licensing documents to the particular persons, although the filing of a certificate with the department may be required by the particular general license. The general license is subject to all other applicable portions of this chapter and any limitations of the general license.
- (2) Specific licenses require the submission of an application to the department and the issuance of a licensing document by the department. The licensee is subject to all applicable portions of this chapter as well as any limitations specified in the licensing document. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.511 GENERAL LICENSES: SOURCE MATERIAL (1) A general license is hereby issued authorizing use and transfer of not more than 15 pounds of source material at any 1 time by persons in the following categories:
- (a) Pharmacists using the source material solely for the compounding of medicinals.
- (b) Physicians using the source material for medicinal purposes.
- (c) Persons receiving possession of source material from pharmacists and physicians in the form of medicinals or drugs.
- (d) Commercial and industrial firms, and research, educational, and medical institutions, and state and local governmental agencies for research, development, educational, commercial or operational purposes.
- (e) And provided, that no such person shall, pursuant to this general license, receive more than a total of 150 pounds of source material in any 1 calendar year.
- (2) Persons who receive, possess, use, or transfer source material pursuant to the general license issued in (1) of this rule are exempt from the provisions of ARM Title 37, chapter 14, subchapters 7 and 17, to the extent that such receipt, possession, use, or transfer is within the terms of such general license; provided, however, that this exemption shall not be deemed to apply to any such person who is also in possession of source material under a specific license issued pursuant to this subchapter.
- (3) A general license is hereby issued authorizing the receipt of title to source material without regard to quantity. This general license does not authorize any person to receive, possess, use, or transfer source material.

- A general license is hereby issued to receive, (4)(a) acquire, possess, use, or transfer, in accordance with the provisions of (b) through (e) below, depleted uranium contained in industrial products or devices for the purpose of providing a concentrated mass in a small volume of the product or device.
- The general license in (a) above applies only to industrial products or devices which have been manufactured either in accordance with a specific license issued to the manufacturer of the products or devices pursuant 37.14.542(13) or in accordance with a specific license issued to the manufacturer by the US nuclear regulatory commission or an agreement state which authorizes manufacture of the products or devices for distribution to persons generally licensed by the US nuclear regulatory commission or an agreement state.
- Persons who receive, acquire, possess, or use (c)(i) depleted uranium pursuant to the general license established by (a) above shall file department form MRH-12, "Registration Certificate -- Use of Depleted Uranium Under General License", with the department. The form shall be submitted within 30 days after the first receipt or acquisition of such depleted uranium. The registrant shall furnish on department form MRH-12 the following information and such other information as may be required by that form:
  - name and address of the registrant;
- (B) a statement that the registrant has developed and will maintain procedures designed to establish physical control over the depleted uranium described in (a) above and designed to prevent transfer of such depleted uranium in any form, including metal scrap, to persons not authorized to receive the depleted uranium; and
- (C) name and/or title, address, and telephone number of the individual duly authorized to act for and on behalf of the registrant in supervising the procedures identified in (B) above.
- The registrant possessing or using depleted uranium under the general license established by (a) above shall report in writing to the department any changes in information furnished by him in department form MRH-12, "Registration Certificate--Use of Depleted Uranium Under General License". The report shall be submitted within 30 days after the effective date of such change.

- (d) A person who receives, acquires, possesses, or uses
  depleted uranium pursuant to the general license established by
  (a) above:
- (i) Shall not introduce such depleted uranium, in any form, into a chemical, physical, or metallurgical treatment or process, except a treatment or process for repair or restoration of any plating or other covering of the depleted uranium.
  - (ii) Shall not abandon such depleted uranium.
- (iii) Shall transfer or dispose of such depleted uranium only by transfer in accordance with the provisions of 37.14.547. In the case where the transferee receives depleted uranium pursuant to the general license established by (a) above, the transferor shall furnish the transferee a copy of this rule and a copy of department form MRH-12. In the case where the transferee receives the depleted uranium pursuant to general license contained in the US nuclear regulatory commission's or agreement state's regulation equivalent to (a) above, the transferor shall furnish the transferee a copy of this rule and a copy of department form MRH-12 accompanied by a note explaining that use of the product or device is regulated by the US nuclear regulatory commission or agreement state under requirements substantially the same as those in this rule.
- (iv) Within 30 days of any transfer, shall report in writing to the department the name and address of the person receiving the depleted uranium pursuant to such transfer.
- (v) Shall not export such depleted uranium except in accordance with a license issued by the US nuclear regulatory commission pursuant to 10 CFR Part 110.
- (e) Any person receiving, acquiring, possessing, using, or transferring depleted uranium pursuant to the general license established by (a) above is exempt from the requirements of ARM Title 37, chapter 14, subchapters 7 and 17, with respect to the depleted uranium covered by that general license. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.512 GENERAL LICENSES: RADIOACTIVE MATERIAL OTHER THAN SOURCE MATERIAL (1) A general license is hereby issued to transfer, receive, acquire, possess, and use radioactive material incorporated in the following devices or equipment which have been manufactured, tested and labeled by manufacturer in accordance with a specific license issued to the manufacturer by the US nuclear regulatory commission for use pursuant to 10 CFR Part 31, section 31.3. This general license is subject to the provisions of ARM 37.14.107, 37.14.108, 37.14.115 and 37.14.116, 37.14.506(1)(b), 37.14.526, 37.14.547, 37.14.550, 37.14.552, and Title 37, chapter 14, subchapters 7 and 17.
- Devices designed for use as static eliminators which (a) contain, as a sealed source or sources, radioactive material consisting of a total of not more than 500 microcuries of polonium-210 per device.
- Devices designed for ionization of air which contain as a sealed source or sources, radioactive material consisting of a total of not more than 500 microcuries of polonium-210 per device or a total of not more than 50 millicuries of hydrogen-3 (tritium) per device.
  - (2) and (3) reserved.
- A general license is hereby issued to commercial and industrial firms and to research, educational and medical institutions, individuals in the conduct of their business, and state or local government agencies to receive, acquire, possess, use, or transfer in accordance with the provisions of (b) through (d) below, radioactive material, excluding special nuclear material, contained in devices designed and manufactured for the purpose of detecting, measuring, gauging or controlling thickness, density, level, interface location, radiation, leakage, or qualitative or quantitative chemical composition, or for producing light or an ionized atmosphere.
- The general license in (a) above applies only to (b) radioactive material contained in devices which have been manufactured and labeled in accordance with the specifications contained in a specific license issued by the department 37.14.542(4) or in accordance with pursuant to ARM specifications contained in a specific license issued by the US nuclear regulatory commission, an agreement state or a licensing state, which authorizes distribution of devices to persons generally licensed by the US nuclear regulatory commission, an agreement state or a licensing state.

- (c) Any person who receives, acquires, possesses, uses, or transfers radioactive material in a device pursuant to the general license in (a) above:
- (i) shall assure that all labels affixed to the device at the time of receipt, and bearing a statement that removal of the label is prohibited, are maintained thereon and shall comply with all instructions and precautions provided by such labels;
- (ii) shall assure that the device is tested for leakage of radioactive material and proper operation of the on/off mechanism and indicator, if any, at no longer than 6-month intervals or at such other intervals as are specified in the label, however,
- (A) devices containing only krypton need not be tested for leakage of radioactive material, and
- (B) devices containing only tritium or not more than 100 microcuries of other beta and/or gamma emitting material or 10 microcuries of alpha emitting material and devices held in storage in the original shipping container prior to initial installation need not be tested for any purpose;
- (iii) shall assure that the tests required by (ii) above and other testing, installation, servicing, and removal from installation involving the radioactive materials, its shielding or containment, are performed:
- (A) in accordance with the instructions provided by the labels, or
- (B) by a person holding an applicable specific license from the department, the US nuclear regulatory commission, an agreement state or a licensing state to perform such activities;
- shall maintain records showing compliance with the requirements of (ii) and (iii) above. The records shall show the results of tests. The records also shall show the dates of performance of, and the names of persons performing, testing, installing, servicing, and removing from installation concerning the radioactive material, its shielding or containment. Records of tests for leakage of radioactive material required by (ii) above shall be maintained for 1 year after the next required leak test is performed or until the sealed source is transferred or disposed of. Records of tests of the on/off mechanism and indicator required by (ii) above shall be maintained for 1 year after the next required test of the on/off mechanism and indicator is performed or until the sealed source is transferred or disposed of. Records which are required by (iii) above shall be maintained for a period of 2 years from the date of the recorded event or until the device is transferred or disposed of;

- Upon the occurrence of a failure of or damage to, or any indication of a possible failure of or damage to, the shielding of the radioactive material or the on/off mechanism or indicator, or upon the detection of 0.005 microcurie or more removable radioactive material, shall immediately operation of the device until it has been repaired by the manufacturer or other person holding an applicable specific license from the department, the US nuclear regulatory commission, an agreement state or a licensing state to repair such devices, or disposed of by transfer to a person authorized by an applicable specific license to receive the radioactive material contained in the device and, within 30 days, furnish to the department a report containing a brief description of the event and the remedial action taken;
- (vi) shall not abandon the device containing radioactive
  material;
- (vii) except as provided in (viii) below, shall transfer or dispose of the device containing radioactive material only by transfer to a specific licensee of the department, the US nuclear regulatory commission, an agreement state, or a licensing state whose specific license authorizes him to receive the device and within 30 days after transfer of a device to a specific licensee shall furnish to the department a report containing identification of the device by manufacturer's name and model number and the name and address of the person receiving the device. No report is required if the device is transferred to the specific licensee in order to obtain a replacement device;
- (viii) shall transfer the device to another general licensee:
- (A) where the device remains in use at a particular location. In such case the transferor shall give the transferee a copy of this rule and any safety documents identified in the label on the device and within 30 days of the transfer, report to the department the manufacturer's name and model number of device transferred, the name and address of the transferee, and the name and/or position of an individual who may constitute a point of contact between the department and the transferee; or
- (B) where the device is held in storage in the original shipping container at its intended location of use prior to initial use by a general licensee; and
- (ix) shall comply with the provisions of ARM 37.14.751 and 37.14.755, for reporting radiation incidents, theft, or loss of licensed material, but shall be exempt from the other requirements of ARM Title 37, chapter 14, subchapters 7 and 17.
- (d) The general license in (a) above does not authorize the manufacture of devices containing radioactive material.

- (e) The general license provided in (a) above is subject to the provisions of ARM 37.14.107, 37.14.108, 37.14.115, 37.14.116 and 37.14.526, 37.14.547, 37.14.550, and 37.14.552.
- (5)(a) A general license is hereby issued to receive, acquire, possess, and use tritium or promethium-147 contained in luminous safety devices for use in aircraft, provided:
- (i) each device contains not more than 10 curies of tritium or 300 millicuries of promethium-147; and
- (ii) each device has been manufactured, assembled or imported in accordance with a specific license issued by the US nuclear regulatory commission, or each device has been manufactured or assembled in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer or assembler of such device.
- (b) Persons who receive, acquire, possess, or use luminous safety devices pursuant to the general license in (a) above are exempt from the requirements of ARM Title 37, chapter 17, subchapters 7 and 17, except that they shall comply with the provisions of ARM 37.14.751 and 37.14.755.
- (c) This general license does not authorize the manufacture, assembly, or repair of luminous safety devices containing tritium or promethium-147.
- (d) This general license does not authorize the ownership, receipt, acquisition, possession or use of promethium-147 contained in instrument dials.
- (e) This general license is subject to the provisions of ARM 37.14.107, 37.14.108, 37.14.115, 37.14.116, 37.14.526, 37.14.547, 37.14.550, and 37.14.552.
- (6) A general license is hereby issued to own radioactive material without regard to quantity. Notwithstanding any other provisions of this subchapter, this general license does not authorize the manufacture, production, transfer, receipt, possession or use of radioactive material.
- (7)(a) A general license is hereby issued to those persons listed below to receive, acquire, possess, use, and transfer, in accordance with the provisions of (d) and (e) below, americium-241 in the form of calibration or reference sources:
- (i) any person who holds a specific license issued by the department which authorizes him to receive, possess, use, and transfer radioactive material; and
- (ii) any person who holds a specific license issued by the US nuclear regulatory commission which authorizes him to receive, possess, use, and transfer special nuclear material.
- (b) A general license is hereby issued to receive, possess, use, and transfer plutonium in the form of calibration or reference sources in accordance with the provisions of (d) and (e) below to any person who holds a specific license issued by the department which authorizes him to receive, possess, use, and transfer radioactive material.

- A general license is hereby issued to receive, possess, use, and transfer radium-226 in the form of calibration or reference sources in accordance with the provisions of (d) and (e) below to any person who holds a specific license issued by the department which authorizes him to receive, possess, use, and transfer radioactive material.
- The general licenses in (a), (b) and (c) above apply (d) only to calibration or reference sources which have been manufactured in accordance with the specifications contained in a specific license issued to the manufacturer or importer of the sources by the US nuclear regulatory commission or which have been manufactured in accordance with the specification contained in a specific license issued to the manufacturer by the department, any agreement state or licensing state.
- (e) The general licenses provided in (a), (b), and (c) above are subject to the provisions of ARM 37.14.107, 37.14.108, 37.14.115, 37.14.116, 37.14.526, 37.14.547, 37.14.550, 37.14.552, and Title 37, chapter 14, subchapters 7 and 17. In addition, persons who receive, acquire, possess, use, or transfer 1 or more calibration or reference sources pursuant to these general licenses:
- (i) shall not possess at any 1 time, at any 1 location of storage or use, more than 5 microcuries of americium-241, 5 microcuries of plutonium, or 5 microcuries of radium-226 in such sources;
- (ii) shall not receive, possess, use, or transfer such source unless the source, or the storage container, bears a label which includes 1 of the following statements, as appropriate, or a substantially similar statement which contains the information called for in 1 of the following statements, as appropriate:
- The receipt, possession, use and transfer of this (A) source, Model \_\_\_\_\_, Serial No. \_\_\_\_, are subject to a general license and the regulations of the US nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority. Do not remove this label.

CAUTION-	-RADIOACTIVE	MATERIA	ALTHIS	SOURCE	CONTA	INS
	(AMERICIUM-	·241 or	PLUTONIU	JMshow	only	the
name of	the appropr	riate ma	aterial.	) DO :	NOT TO	OUCH
RADIOACT	TVE PORTION (	OF THIS	SOURCE.			

Name of manufacturer of importer

(B) The receipt, possession, use and transfer of this source, Model \_\_\_\_\_, Serial No. \_\_\_\_\_, are subject to a general license and the regulations of any licensing state. Do not remove this label.

CAUTION--RADIOACTIVE MATERIAL--THIS SOURCE CONTAINS RADIUM-226. DO NOT TOUCH RADIOACTIVE PORTION OF THIS SOURCE.

### Name of manufacturer or importer

- (iii) shall not transfer, abandon, or dispose of such source except by transfer to a person authorized by a license from the department, the US nuclear regulatory commission, an agreement state or a licensing state to receive the source;
- (iv) shall store such source, except when the source is being used, in a closed container adequately designed and constructed to contain americium-241, plutonium, or radium-226 which might otherwise escape during storage; and
- (v) shall not use such source for any purpose other than the calibration of radiation detectors or the standardization of other sources.
- (f) These general licenses do not authorize the manufacture of calibration or reference sources containing americium-241, plutonium, or radium-226.
- (8)(a) A general license is hereby issued to any physician to receive, possess, transfer, or use radioactive material set forth below for the stated diagnostic uses, provided, however, that the use is in accordance with the provision of (b), (c) and (d) below, the radioactive material is in the form of capsules, disposable syringes, or other prepackaged individual doses; and the radioactive material has been manufactured in accordance with a specific license issued by the department pursuant to ARM 37.14.542(7), or by the US nuclear regulatory commission, any agreement state or a licensing state pursuant to equivalent regulations authorizing distribution to persons generally licensed pursuant to (8) or its equivalent:
- (i) iodine-131 as sodium iodide (Na<sup>131</sup>I) for measurement of thyroid uptake;
- (ii) iodine-131 as iodinated human serum albumin (IHSA) for determinations of blood and blood plasma volume;
- (iii) iodine-125 as iodinated human serum albumin (IHSA) for determinations of blood and blood plasma volume;
  - (iv) (reserved)
- (v) cobalt-58 for the measurement of intestinal absorption of cyanocobalamin;
- (vi) cobalt-60 for the measurement of intestinal absorption of cyanocobalamin; and

- (vii) chromium-51 as sodium radiochromate for determination of red blood cell volumes and studies of red blood cell survival time.
- (b) No physician shall receive, possess, use, or transfer radioactive material pursuant to the general license established by (a) above until he has filed department form MRH-10, "Certificate--Medical Use of Radioactive Material Under General License" with the department and received from the department a validated copy of the department form MRH-10 with certification number assigned. The generally licensed physician shall furnish on department form MRH-10 the following information and such other information as may be required by that form:
  - (i) name and address of the generally licensed physician;
- (ii) a statement that the generally licensed physician is a duly licensed physician (authorized to dispense drugs) in the practice of medicine in Montana; and
- (iii) a statement that the generally licensed physician has appropriate radiation measuring instruments to carry out the diagnostic procedures for which he proposes to use radioactive material under the general license of this (8) and that he is competent in the use of such instruments.
- (c) A physician who receives, possesses, or uses a pharmaceutical containing radioactive material pursuant to the general license established by (a) above shall comply with the following:
- (i) He shall not possess at any 1 time, pursuant to the general license in (a) above more than:
  - (A) 200 microcuries of iodine-131,
  - (B) 200 microcuries of iodine-125,
  - (C) 5 microcuries of cobalt-57,
  - (D) 5 microcuries of cobalt-58,
  - (E) 5 microcuries of cobalt-60, and
  - (F) 200 microcuries of chromium-51;
- (ii) he shall store the pharmaceutical in the original shipping container, or a container providing equivalent radiation protection until administered;
- (iii) he shall use the pharmaceutical only for the uses authorized by (a) above;
- (iv) he shall not administer the pharmaceutical to a woman with confirmed pregnancy or to a person under 18 years of age; and
- (v) he shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, the US nuclear regulatory commission, any agreement state or licensing state, or in any manner other than in the unopened, labeled shipping container as received from the supplier, except by administering it to a patient.

- (d) The generally licensed physician possessing or using radioactive material under the general license of (a) above shall report in duplicate to the department, any changes in the information furnished by him in the "Certificate--Medical Use of Radioactive Material Under General License", department form MRH-10. The report shall be submitted within 30 days after the effective date of such change.
- (e) Any person using radioactive material pursuant to the general license of (a) above is exempt from the requirements of ARM Title 37, chapter 14, subchapters 7 and 17, with respect to the radioactive material covered by the general license.
- (9)(a) A general license is hereby issued to any physician, clinical laboratory or hospital to receive, acquire, possess, transfer, or use, for any of the following stated tests, in accordance with the provisions of (b) through (f) below, the following radioactive materials in prepackaged units:
- (i) Iodine-125, in units not exceeding 10 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (ii) Iodine-131, in units not exceeding 10 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (iii) Carbon-14, in units not exceeding 10 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (iv) Hydrogen-3 (tritium), in units not exceeding 50 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.

- (v) Iron-59, in units not exceeding 20 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (vi) Cobalt-57, in units not exceeding 10 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (vii) Selenium-75, in units not to exceed 10 microcuries each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (viii) Mock Iodine-125 reference or calibration sources, in units not exceeding 0.05 microcurie of iodine-129 and 0.005 microcurie of americium-241 each for use in in vitro clinical or laboratory tests not involving internal or external administration of radioactive material, or the radiation therefrom, to human beings or animals.
- (b) No person shall receive, acquire, possess, use or transfer radioactive material pursuant to the general license established by (a) above until he has filed department form MRH-11, "Certificate--In Vitro Testing with Radioactive Material Under General License", with the department and received from the department a validated copy of department form MRH-11 with certification number assigned, or until he has been authorized pursuant to ARM 37.14.540(3)(c) to use radioactive material under the general license in (9). The physician, clinical laboratory or hospital shall furnish on department form MRH-11 the following information and such other information as may be required by that form:
- (i) name and address of the physician, clinical laboratory or hospital;
  - (ii) the location of use; and
- (iii) a statement that the physician, clinical laboratory or hospital has appropriate radiation measuring instruments to carry out in vitro clinical or laboratory tests with radioactive material as authorized under the general license in (a) above and that such tests will be performed only by personnel competent in the use of such instruments and in the handling of the radioactive material.

- (c) A person who receives, acquires, possesses or uses radioactive material pursuant to the general license established by (a) above shall comply with the following:
- (i) The general licensee shall not possess at any 1 time, pursuant to the general license in (a) above, at any 1 location of storage or use, a total amount of iodine-125, iodine-131, selenium-75, iron-59, and/or cobalt-57 in excess of 200 microcuries.
- (ii) The general licensee shall store the radioactive material, until used, in the original shipping container or in a container providing equivalent radiation protection.
- (iii) The general licensee shall use the radioactive material only for the uses authorized by (a) above.
- (iv) The general licensee shall not transfer the radioactive material to a person who is not authorized to receive it pursuant to a license issued by the department, the US nuclear regulatory commission, any agreement state or licensing state, nor transfer the radioactive material in any manner other than in the unopened, labeled shipping container as received from the supplier.
- (v) The general licensee shall dispose of the mock iodine-125 reference or calibration sources described in (a)(viii) above as required by ARM 37.14.740.
- (d) The general licensee shall not receive, acquire, possess, or use radioactive material pursuant to (a) above:
- (i) Except as prepackaged units which are labeled in accordance with the provisions of an applicable specific license issued pursuant to ARM 37.14.542(8) in accordance with the provisions of a specific license issued by the US nuclear regulatory commission, any agreement state or licensing state which authorizes the manufacture and distribution of iodine-125, iodine-131, carbon-14, hydrogen-3 (tritium), iron-59, selenium-75, cobalt-57, or mock iodine-125 to persons generally licensed under (9) or its equivalent, and
- (ii) unless 1 of the following statements, as appropriate, or a substantially similar statement which contains the information called for in 1 of the following statements, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

(A) This radioactive material shall be received, acquired, possessed, and used only by physicians, clinical laboratories or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of the US nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

Name of manufacturer

(B) This radioactive material shall be received, acquired, possessed, and used only by physicians, clinical laboratories or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use and transfer are subject to the regulations and a general license of a licensing state.

#### Name of manufacturer

- (e) The physician, clinical laboratory or hospital possessing or using radioactive material under the general license of (a) above shall report in writing to the department, any changes in the information furnished by him in the "Certificate--In Vitro Testing with Radioactive Material Under General License", department form MRH-11. The report shall be furnished within 30 days after the effective date of such change.
- (f) Any person using radioactive material pursuant to the general license of (a) above is exempt from the requirements of ARM Title 37, chapter 14, subchapters 7 and 17, with respect to radioactive material covered by that general license, except that such persons using the mock iodine-125 described in (a)(viii) above shall comply with the provisions of ARM 37.14.740, 37.14.751, and 37.14.755.

- (10)(a) A general license is hereby issued to receive, acquire, possess, use, and transfer strontium-90 contained in ice detection devices, provided each device contains not more than 50 microcuries of strontium-90 and each device has been manufactured or imported in accordance with a specific license issued by the US nuclear regulatory commission or each device has been manufactured in accordance with the specifications contained in a specific license issued by the department or any agreement state to the manufacturer of such device.
- (b) Persons who receive, acquire, possess, use, or transfer strontium-90 contained in ice detection devices pursuant to the general license in (a) above:
- (i) shall, upon occurrence of visually observable damage, such as a bend or crack or discoloration from overheating to the device, discontinue use of the device until it has been inspected, tested for leakage and repaired by a person holding a specific license from the US nuclear regulatory commission or an agreement state to manufacture or service such devices; or shall dispose of the device pursuant to the provisions of ARM 37.14.740.
- (ii) shall assure that all labels affixed to the device at the time of receipt, and which bear a statement which prohibits removal of the labels, are maintained thereon; and
- (iii) are exempt from the requirements of ARM Title 37, chapter 14, subchapters 7 and 17, except that such persons shall comply with the provisions of ARM 37.14.740, 37.14.751, and 37.14.755.
- (c) This general license does not authorize the manufacture, assembly, disassembly or repair of strontium-90 in ice detection devices.
- (d) This general license is subject to the provisions of ARM 37.14.107, 37.14.108, 37.14.115, 37.14.116, 37.14.526, 37.14.547, 37.14.550, and 37.14.552. (History: Sec. 75-3-202, MCA;  $\underline{IMP}$ , Sec. 75-3-202, MCA;  $\underline{NEW}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{TRANS}$ , from DHES, 1996 MAR p. 433;  $\underline{TRANS}$ , from DEQ, 2000 MAR p. 189.)

- 37.14.513 GENERAL LICENSES: INTRASTATE TRANSPORTATION OF RADIOACTIVE MATERIAL (1) A general license is hereby issued to contract carrier to transport and any common or radioactive material in the regular course of their carriage for another or storage incident thereto, provided the transportation and storage is in accordance with the applicable requirements of the regulations, appropriate to the mode of transport, of the US department of transportation insofar as such regulations relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting. Any notification of incidents referred to in those requirements shall be filed with, or made to, the department. Persons who transport and store radioactive material pursuant to the general license in this subsection are exempt from the requirements of ARM Title 37, chapter 14, subchapters 7 and 17.
- (2) A general license is hereby issued to any private carrier to transport radioactive material, provided the transportation is in accordance with the applicable requirements of the regulations, appropriate to the mode of transport, of the US department of transportation insofar as such regulations relate to the loading and storage of packages, placarding of the transporting vehicle, and incident reporting. Any notification of incidents referred to in those requirements shall be filed with, or made to, the department.
- (a) Persons who transport radioactive material pursuant to the general license in (2) are exempt from the requirements of ARM Title 37, chapter 14, subchapters 7 and 17, to the extent that they transport radioactive material.
- (b) Physicians, as defined in ARM 37.14.102 are exempt from the requirements of (2) to the extent that they transport radioactive material for use in the practice of medicine. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 14 through 19 reserved

- 37.14.520 SPECIFIC LICENSES: FILING APPLICATION FOR SPECIFIC LICENSES (1) Applications for specific licenses shall be filed on a form prescribed by the department.
- (2) The department may at any time after the filing of the original application, and before the expiration of the license, require further statements in order to enable the department to determine whether the application should be granted or denied or whether a license should be modified or revoked.
- (3) Each application shall be signed by the applicant or licensee or a person duly authorized to act for and on his behalf.
- (4) An application for a license may include a request for a license authorizing 1 or more activities.
- (5) In his application, the applicant may incorporate by reference information contained in previous applications, statements, or reports filed with the department provided such references are clear and specific. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.521 SPECIFIC LICENSES: GENERAL REQUIREMENTS FOR THE ISSUANCE OF SPECIFIC LICENSES A license application will be approved if the department determines that:
- (1) the applicant is qualified by reason of training and experience to use the material in question for the purpose requested in accordance with this chapter in such a manner as to minimize danger to public health and safety or property;
- (2) the applicant's proposed equipment, facilities, and procedures are adequate to minimize danger to public health and safety or property;
- (3) the issuance of the license will not be inimical to the health and safety of the public; and
- (4) the applicant satisfies any applicable special requirements in ARM 37.14.540, 37.14.541, or 37.14.542. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.522 SPECIFIC LICENSES: ISSUANCE OF (1) Upon a determination that an application meets the requirements of the act and the rules of the department, the department will issue a specific license authorizing the proposed activity in such form and containing such conditions and limitations as it deems appropriate or necessary.
- (2) The department may incorporate in any license at the time of issuance, or thereafter by appropriate rule, regulation, or order, such additional requirements and conditions with respect to the licensee's receipt, possession, use, and transfer of radioactive material subject to this subchapter as it deems appropriate or necessary in order to:
- (a) minimize danger to public health and safety or property;
- (b) require such reports and the keeping of such records, and to provide for such inspections of activities under the license as may be appropriate or necessary; and
- (c) prevent loss or theft of material subject to this subchapter. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 23 through 25 reserved

- 37.14.526 SPECIFIC LICENSES: SPECIFIC TERMS AND CONDITIONS OF LICENSE (1) Each license issued pursuant to this subchapter shall be subject to all the provisions of the act, now or hereafter in effect, and to all rules, regulations, and orders of the department.
- (2) No license issued or granted under this subchapter and no right to possess or utilize radioactive material granted by any license issued pursuant to this subchapter shall be transferred, assigned, or in any manner disposed of, either voluntarily or involuntarily, directly or indirectly, through transfer of control of any license to any person unless the department shall, after securing full information find that the transfer is in accordance with the provisions of the act, and shall give its consent in writing.
- (3) Each person licensed by the department pursuant to this subchapter shall confine his use and possession of the material licensed to the locations and purposes authorized in the license. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### 37.14.527 SPECIFIC LICENSES: EXPIRATION OF LICENSES

(1) Except as provided in ARM 37.14.528(2), each specific license shall expire at the end of the day, in the month and year stated therein. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

#### 37.14.528 SPECIFIC LICENSES: RENEWAL OF LICENSE

- (1) Applications for renewal of specific licenses shall be filed in accordance with ARM 37.14.520.
- (2) In any case in which a licensee, not less than 30 days prior to expiration of his existing license, has filed an application in proper form for renewal or for a new license authorizing the same activities, such existing license shall not expire until the application has been finally determined by the department. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

37.14.529 SPECIFIC LICENSES: AMENDMENT OF LICENSES AT REQUEST OF LICENSEE (1) Applications for amendment of a license shall be filed in accordance with ARM 37.14.520 and shall specify the respects in which the licensee desires his license to be amended and the grounds for such amendment. (History: Sec. 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-202, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; <u>TRANS</u>, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 30 through 34 reserved

37.14.535 SPECIFIC LICENSES: DEPARTMENT ACTION ON APPLICATIONS TO RENEW AND AMEND (1) In considering an application by a licensee to renew or amend his license, the department will apply the criteria set forth in ARM 37.14.521, 37.14.540, 37.14.541 or 37.14.542, as applicable. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 36 through 39 reserved

- 37.14.540 SPECIFIC LICENSES: SPECIAL REQUIREMENTS FOR ISSUANCE OF CERTAIN SPECIFIC LICENSES FOR RADIOACTIVE MATERIAL
- (1) In addition to the requirements set forth in ARM 37.14.521, a specific license for human use of radioactive material in institutions will be issued if:
- (a) the applicant has appointed a medical isotopes committee of at least 3 members to evaluate all proposals for research, diagnostic, and therapeutic use of radioactive material within that institution. Membership of the committee should include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in assay of radioactive material and protection against radiation;
- (b) the applicant possesses adequate facilities for the clinical care of patients;
- (c) the physician designated on the application as the individual user has substantial experience in the handling and administration of radioactive material and, where applicable, the clinical management of radioactive patients; and
- (d) if the application is for a license to use unspecified quantities or multiple types of radioactive material, the applicant's staff has substantial experience in the use of a variety of radioactive materials for a variety of human uses.
- (2)(a) An application by an individual physician or group of physicians for a specific license for human use of radioactive material will be approved if:
- (i) the applicant satisfies the general requirements specified in ARM 37.14.521;
- (ii) the application is for use in the applicant's practice in an office outside a medical institution;
- (iii) the applicant has access to a hospital possessing adequate facilities to hospitalize and monitor the applicant's radioactive patients whenever it is advisable; and
- (iv) the applicant has extensive experience in the proposed use, the handling and administration of radionuclides, and where applicable, the clinical management of radioactive patients.
- (b) The department will not approve an application by an individual physician or group of physicians for a specific license to receive, possess, or use radioactive material on the premises of a medical institution unless:
  - (i) the use of radioactive material is limited to:
- (A) the administration of radiopharmaceuticals for diagnostic or therapeutic purposes,
- (B) the performance of diagnostic studies on patients to whom a radiopharmaceutical has been administered,
  - (C) the performance of in vitro diagnostic studies, or
- (D) the calibration and quality control checks of radioactive assay instrumentation, radiation safety instrumentation and diagnostic instrumentation;

- (ii) the physician brings the radioactive material with him and removes the radioactive material when he departs. (The institution cannot receive, possess, or store radioactive material other than the amount of material remaining in the patient); and
- (iii) the medical institution does not hold a radioactive material license under (1) of this rule.
- (3)(a) Subject to the provisions of (b), (c), and (d) below, an application for a specific license pursuant to (1), (2), or (4) of this rule for any medical use or uses of radioactive material specified in 1 or more of Groups I to VI, inclusive, of Schedule C of this subchapter will be approved for all of the uses within the group or groups which include the use or uses specified in the application if:
- (i) the applicant satisfies the requirements of (1), (2), or (4) of this rule;
- (ii) the applicant, or the physician designated in the application as the individual user, has adequate clinical experience in the types of uses included in the group or groups;
- (iii) the applicant, or the physicians and all other personnel who will be involved in the preparation and use of the radioactive material, have adequate training and experience in the handling of radioactive material appropriate to their participation in the uses included in the group or groups;
- (iv) the applicant's radiation detection and measuring instrumentation is adequate for conducting the procedures involved in the uses included in the group or groups; and
- (v) the applicant's radiation safety operating procedures are adequate for handling and disposal of the radioactive material involved in the uses included in the group or groups.
- (b) Any licensee or registrant who is authorized to use radioactive material pursuant to 1 or more groups in (a) above and Schedule C of this subchapter is subject to the following conditions:
- (i) For groups I, II, IV, and V, no licensee or registrant shall receive, possess, or use radioactive material except as a radiopharmaceutical manufactured in the form to be administered to the patient, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to ARM 37.14.542(10), a specific license issued by the US nuclear regulatory commission, or a specific license issued by an agreement state or a licensing state pursuant to equivalent regulations.
- (ii) For Group III, no licensee or registrant shall receive, possess, or use generators or reagent kits containing radioactive material or shall use reagent kits that do not contain radioactive material to prepare radiopharmaceuticals containing radioactive material, except:

- (A) reagent kits not containing radioactive material that are approved by the department, the US nuclear regulatory commission, an agreement state or a licensing state for use by persons licensed pursuant to (3) and Schedule C of this subchapter or equivalent regulations; or
- (B) generators or reagent kits containing radioactive material that are manufactured, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to ARM 37.14.542(11), a specific license issued by the US nuclear regulatory commission, or a specific license issued by an agreement state or a licensing state pursuant to equivalent regulations.
- (iii) For Group VI, no licensee or registrant shall receive, possess, or use radioactive material except as contained in a source or device that has been manufactured, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to ARM 37.14.542(12), a specific license issued by the US nuclear regulatory commission, or a specific license issued to the manufacturer by an agreement state or a licensing state pursuant to equivalent regulations.
- (iv) For Group III, any licensee or registrant who uses generators or reagent kits shall elute the generator or process radioactive material with the reagent kit in accordance with instructions which are approved by the department, the US nuclear regulatory commission, an agreement state or a licensing state and are furnished by the manufacturer on the label attached to or in the leaflet or brochure which accompanies the generator or reagent kit.
- (v) For Group VI any licensee who possesses and uses sources or devices containing radioactive material shall:
- (A) cause each source or device containing more than 100 microcuries of radioactive material with a half-life greater than 30 days, except iridium-192 seeds encased in nylon ribbon, to be tested for contamination and/or leakage at intervals not to exceed 6 months or at such other intervals as are approved by the department, the US nuclear regulatory commission, an agreement state or a licensing state and described by the manufacturer on the label attached to the source, device, or permanent container thereof, or in the leaflet or brochure which accompanies the source or device. Each source or device shall be so tested prior to its first use unless the supplier furnishes a certificate that the source or device has been so tested within 6 months prior to the transfer;

- (B) assure that the test required by (A) above shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample or in the case of radium, the escape of radon at the rate of 0.001 microcurie per 24 hours. The test sample shall be taken from the source or from the surfaces of the device in which the source is permanently or semi-permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department;
- (C) if the test required by (A) above reveals the presence of 0.005 microcurie or more of removable contamination or in the case of radium, the escape of radon at the rate of 0.001 microcurie per 24 hours, immediately withdraw the source from use and cause it to be decontaminated and repaired or to be disposed of in accordance with department rules. A report shall be filed within 5 days of the test with the department, describing the equipment involved, the test results, and the corrective action taken;
- follow the radiation safety and handling instructions approved by the department, the US nuclear regulatory licensing commission, an agreement state or state and a furnished by the manufacturer on the label attached to the source, device or permanent container thereof, or in the leaflet or brochure which accompanies the source or device, and maintain such instruction in a legible and conveniently available form;
- (E) conduct a quarterly physical inventory to account for all sources and devices received and possessed. Records of the inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, location of sources and devices, and the date of the inventory;
- (F) assure that needles or standard medical applicator cells containing radium-226, or cobalt-60 as wire are not opened while in the licensee's possession unless specifically authorized by a license issued to him by the department; and
- (G) assure that patients containing cobalt-60, cesium-137, iridium-192 and/or radium-226 implants shall remain hospitalized until the implants are removed.
- (c) Any licensee who is licensed pursuant to (3)(a) above for 1 or more of the medical use groups in Schedule C of this subchapter also is authorized to use radioactive material under the general license in ARM 37.14.512(9) for the specified in vitro uses without filing department form MRH-11 as required in ARM 37.14.512(9)(b); provided, that the licensee is subject to the other provisions of ARM 37.14.512(9).

- (d) Any licensee who is licensed pursuant to (3)(a) above for 1 or more of the medical use groups in Schedule C of this subchapter also is authorized, subject to the provisions of (d) and (e) below, to receive, possess, and use for calibration and reference standards:
- (i) any radioactive material listed in Group I, Group II, or Group III of Schedule C of this subchapter with a half-life not longer than 100 days, in amounts not to exceed 15 millicuries total;
- (ii) any radioactive material listed in Group I, Group II, or Group III of Schedule C of this subchapter with half-life greater than 100 days in amounts not to exceed 200 microcuries total;
- (iii) technetium-99m in amounts not to exceed 30 millicuries; and
- (iv) any radioactive material, in amounts not to exceed 3 millicuries per source, contained in calibration or reference sources that have been manufactured, labeled, packaged, and distributed in accordance with a specific license issued by the department pursuant to ARM 37.14.542(12), a specific license issued by the US nuclear regulatory commission, or a specific license issued to the manufacturer by an agreement state or a licensing state pursuant to equivalent regulations.
- (e)(i) Any licensee or registrant who possesses sealed sources as calibration or reference sources pursuant to (d) above shall cause each sealed source containing radioactive material, other than hydrogen-3, with a half-life greater than 30 days in any form other than gas to be tested for leakage and/or contamination at intervals not to exceed 6 months. In the absence of a certificate from a transferor indicating that a test has been made within 6 months prior to the transfer, the sealed sources should not be used until tested, provided, however, that no leak tests are required when:
- (A) the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material, or
- (B) the sealed source is stored and is not being used; such sources shall, however, be tested for leakage prior to any use or transfer unless they have been leak tested within 6 months prior to the date of use or transfer.
- (ii) The leak test shall be capable of detecting the presence of 0.005 microcuries of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is mounted or stored on which contamination might be expected to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department.

- (iii) If the leak test reveals the presence of 0.005 microcuries or more of removable contamination, the licensee or registrant shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with ARM Title 37, chapter 14, subchapters 5 and 7. A report shall be filed within 5 days of the test with the department describing the equipment involved, the test results, and the corrective action taken.
- (f) Any licensee or registrant who possesses and uses calibration and reference sources pursuant to (d)(iv) above shall:
- (i) follow the radiation safety and handling instructions approved by the department, the US nuclear regulatory commission, an agreement state or a licensing state and furnished by the manufacturer on the label attached to the source, or permanent container thereof, or in the leaflet or brochure that accompanies the source, and maintain such instruction in a legible and conveniently available form; and
- (ii) conduct a quarterly physical inventory to account for all sources received and possessed. Records of the inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, location of sources, and the date of the inventory.
- (4) In addition to the requirements set forth in ARM 37.14.521, a specific license for human use of sealed sources will be issued only if the applicant or, if the application is made by an institution, the individual user:
- (a) has specialized training in the diagnostic or therapeutic use of the sealed source considered, or has experience equivalent to such training, and
  - (b) is a physician.
- (5) In addition to the requirements set forth in ARM 37.14.521, a specific license for use of sealed sources in industrial radiography will be issued if:
- (a) the applicant will have an adequate program for training radiographers and radiographer's assistants and submits to the department a schedule or description of such program which specifies the:
  - (i) initial training,
  - (ii) periodic training,
  - (iii) on-the-job training,
- (iv) means to be used by the licensee to determine the radiographer's knowledge and understanding of an ability to comply with department rules and licensing requirements, and the operating and emergency procedures of the applicant, and
- (v) means to be used by the licensee to determine the radiographer's assistant's knowledge and understanding of and ability to comply with the operating and emergency procedures of the applicant;

- (b) the applicant has established and submits to the department satisfactory written operating and emergency procedures;
- (c) the applicant will have an adequate internal inspection system, or other management control, to assure that license provisions, rules, and the applicant's operating and emergency procedures are followed by radiographers and radiographer's assistants;
- (d) the applicant submits to the department a description of his overall organizational structure pertaining to the industrial radiography program, including specified delegations of authority and responsibility for operation of the program;
- (e) the applicant who desires to conduct his own leak tests has established adequate procedures to be followed in leak testing sealed sources for possible leakage and contamination and submits to the department a description of such procedures including:
  - (i) instrumentation to be used,
- (ii) method of performing tests, e.g., points on equipment to be smeared and method of taking smear, and
- (iii) pertinent experience of the person who will perform the test; and
- (f) the licensee shall conduct a program for inspection and maintenance of radiographic exposure devices and storage containers to assure proper functioning of components important to safety. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.541 SPECIFIC LICENSES: SPECIAL REQUIREMENTS FOR SPECIFIC LICENSES OF BROAD SCOPE (1) This rule prescribes requirements for the issuance of specific licenses of broad scope for radioactive material ("broad licenses") and certain rules governing holders of such licenses. Authority to transfer possession of control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing by-product material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the US Nuclear Regulatory Commission, Washington, DC 20555.
- (2) The different types of broad licenses are set forth below:
- (a) "Type A specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of the radioactive material specified in the license, but not exceeding quantities specified in the license, for any authorized purposes. The quantities specified are usually in the multi-curie range.
- A "Type B specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of radioactive material specified in Schedule D of this subchapter, for any authorized purposes. The possession limit for a Type B broad license, if only 1 radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Schedule D, Column I. If 2 or more radionuclides are possessed thereunder, the possession limit for each is determined as follows: each radionuclide, determine the ratio of the quantity possessed to the applicable quantity specified in Schedule D, Column I, for that radionuclide. The sum of the ratios for radionuclides possessed under the license shall not exceed unity.
- A "Type C specific license of broad scope" is a specific license authorizing receipt, acquisition, ownership, possession, use and transfer of any chemical or physical form of radioactive material specified in Schedule D of this subchapter, for any authorized purpose. The possession limit for a Type C broad license, if only 1 radionuclide is possessed thereunder, is the quantity specified for that radionuclide in Schedule D, Column II. If 2 or more radionuclides are possessed thereunder, the possession limit is determined for each as follows: each radionuclide determine the ratio of the quantity possessed to the applicable quantity specified in Schedule D, Column II for that radionuclide. The sum of the ratios for radionuclides possessed under the license shall not exceed unity.

- (3) An application for a Type A specific license of broad scope will be approved if:
- (a) the applicant satisfies the general requirements specified in ARM 37.14.521;
- (b) the applicant has engaged in a reasonable number of activities involving the use of radioactive material; and
- (c) the applicant has established administrative controls and provisions relating to organization and management, procedures, record keeping, material control and accounting, and management review that are necessary to assure safe operations, including:
- (i) the establishment of a radiation safety committee composed of such persons as a radiation safety officer, a representative of management, and persons trained and experienced in the safe use of radioactive material;
- (ii) the appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters; and
- (iii) the establishment of appropriate administrative procedures to assure:
- (A) control of procurement and use of radioactive material;
- (B) completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures; and
- (C) review, approval, and recording by the radiation safety committee of safety evaluations of proposed uses prepared in accordance with (B) above prior to use of the radioactive material.
- (4) An application for a Type B specific license of broad scope will be approved if:
- (a) the applicant satisfies the general requirements specified in ARM 37.14.521; and
- (b) the applicant has established administrative controls and provisions relating to organization and management, procedures, record keeping, material control and accounting, and management review that are necessary to assure safe operations, including:
- (i) the appointment of a radiation safety officer who is qualified by training and experience in radiation protection, and who is available for advice and assistance on radiation safety matters, and
- (ii) the establishment of appropriate administrative procedures to assure:
- (A) control of procurement and use of radioactive material,

- (B) completion of safety evaluations of proposed uses of radioactive material which take into consideration such matters as the adequacy of facilities and equipment, training and experience of the user, and the operating or handling procedures, and
- (C) review, approval, and recording by the radiation safety officer of safety evaluations of proposed uses prepared in accordance with (B) above prior to use of the radioactive material.
- (5) An application for a Type C specific license of broad scope will be approved if:
- (a) the applicant satisfies the general requirements specified in ARM 37.14.521;
- (b) the applicant submits a statement that radioactive material will be used only by, or under the direct supervision of, individuals who have received:
- (i) a college degree at the bachelor level, or equivalent training and experience, in the physical or biological sciences or in engineering, and
- (ii) at least 40 hours of training and experience in the safe handling of radioactive material, and in the characteristics of ionizing radiation, units of radiation dose and quantities, radiation detection instrumentation, and biological hazards of exposure to radiation appropriate to the type and forms of radioactive material to be used; and
- (c) the applicant has established administrative controls and provisions relating to procurement of radioactive material, procedures, record keeping, material control and accounting, and management review necessary to assure safe operations.
- (6) Specific licenses of broad scope are subject to the following conditions:
- (a) Unless specifically authorized, persons licensed pursuant to this rule shall not:
- (i) conduct tracer studies in the environment involving direct release of radioactive material;
- (ii) receive, acquire, own, possess, use or transfer devices containing 100,000 curies or more of radioactive material in sealed sources used for irradiation of materials;
- (iii) conduct activities for which a specific license issued by the department under ARM 37.14.540 or 37.14.542 is required; or
- (iv) add or cause the addition of radioactive material to any food, beverage, cosmetic, drug, or other product designed for ingestion or inhalation by, or application to, a human being.

- (b) Each Type A specific license of broad scope issued under this subchapter shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety committee.
- (c) Each Type B specific license of broad scope issued under this subchapter shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals approved by the licensee's radiation safety officer.
- (d) Each Type C specific license of broad scope issued under this subchapter shall be subject to the condition that radioactive material possessed under the license may only be used by, or under the direct supervision of, individuals who satisfy the requirements of (5) of this rule. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEO, 2000 MAR p. 189.)

- 37.14.542 SPECIFIC LICENSES: SPECIAL REQUIREMENTS FOR A SPECIFIC LICENSE TO MANUFACTURE, ASSEMBLE, REPAIR, OR DISTRIBUTE COMMODITIES, PRODUCTS, OR DEVICES WHICH CONTAIN RADIOACTIVE MATERIAL (1)(a) In addition to the requirements set forth in ARM 37.14.521, a specific license authorizing the introduction of radioactive material into a product or material owned by or in the possession of the licensee or another to be transferred to persons exempt under ARM 37.14.506(1)(b) will be issued if:
- the applicant submits a description of the product or material into which the radioactive material will be introduced, intended use of the radioactive material and the product or material into which it is introduced, method of introduction, initial concentration of the radioactive material in the product or material, control methods to assure that no more than the specified concentration is introduced into the product material, estimated time interval between introduction transfer of the product or material, and estimated concentration of the radioactive material in the product or material at the time of transfer; and
- the applicant provides reasonable assurance that the concentrations of radioactive material at the time of transfer will not exceed the concentrations in Schedule A of this subchapter, that reconcentrating of the radioactive material in concentrations exceeding those in Schedule A is not likely, that use of lower concentrations is not feasible, and that the product or material is not likely to be incorporated in any food, beverage, cosmetic, drug or other commodity or product designed for ingestion or inhalation by, or application to, a human being.
- (b) Each person licensed under (1) shall file an annual report with the department which shall identify the type and quantity of each product or material into which radioactive material has been introduced during the reporting period; name and address of the person who owned or possessed the product or material, into which radioactive material has been introduced, at the time of introduction; the type and quantity radionuclide introduced into each such product or material; and the initial concentrations of the radionuclide in the product or material at time of transfer of the radioactive material by the If no transfers of radioactive material have been licensee. made pursuant to (1) during the reporting period, the report shall so indicate. The report shall cover the year ending June 30, and shall be filed within 30 days thereafter.

- (2) Authority to transfer possession or control by the manufacturer, processor, or producer of any equipment, device, commodity, or other product containing by-product material whose subsequent possession, use, transfer, and disposal by all other persons are exempted from regulatory requirements may be obtained only from the US Nuclear Regulatory Commission, Washington, DC 20555.
- (a) An application for a specific license to distribute naturally-occurring and accelerator-produced radioactive materials (NARM) to persons exempted from this subchapter pursuant to ARM 37.14.506(2) will be approved if:
- (i) the radioactive material is not contained in any food, beverage, cosmetic, drug, or other commodity designed for ingestion or inhalation by, or application to, a human being;
- (ii) the radioactive material is in the form of processed chemical elements, compounds, or mixtures, tissue samples, bioassay samples, counting standards, plated or encapsulated sources, or similar substances, identified as radioactive and to be used for its radioactive properties, but is not incorporated into any manufactured or assembled commodity, product, or device intended for commercial distribution; and
- (iii) the applicant submits copies of prototype labels and brochures and the department approves such labels and brochures.
- (b) The license issued under (a) above is subject to the following conditions:
- (i) No more than 10 exempt quantities shall be sold or transferred in any single transaction. However, an exempt quantity may be composed of fractional parts of 1 or more of the exempt quantity provided the sum of the fractions shall not exceed unity.
- (ii) Each exempt quantity shall be separately and individually packaged. No more than 10 such packaged exempt quantities shall be contained in any outer package for transfer to persons exempt pursuant to ARM 37.14.506(2). The outer package shall be such that the dose rate at the external surface of the package does not exceed 0.5 millirem per hour.
- (iii) The immediate container of each quantity or separately packaged fractional quantity of radioactive material shall bear a durable, legible label which:
- (A) identifies the radionuclide and the quantity of radioactivity, and
  - (B) bears the words "Radioactive Material".
- (iv) In addition to the labeling information required by
  (iii) above, the label affixed to the immediate container, or an
  accompanying brochure, shall:
- (A) state that the contents are exempt from licensing state requirements,

- (B) bear the words "Radioactive Material--Not for Human Use--Introduction into Foods, Beverages, Cosmetics, Drugs, or Medicinals, or into Products Manufactured for Commercial Distribution is Prohibited--Exempt Quantities should not be Combined", and
- (C) set forth appropriate additional radiation safety precautions and instructions relating to the handling, use, storage, and disposal of the radioactive material.
- (c) Each person licensed under (2) shall maintain records by name and address, each person to whom identifying, transferred for radioactive material is use 37.14.506(2) or the equivalent regulations of a licensing state, and stating the kinds and quantities of radioactive material transferred. An annual summary report stating the total quantity of each radionuclide transferred under the specific license shall be filed with the department. Each report shall cover the year ending June 20, and shall be filed within 30 days thereafter. If no transfers of radioactive material have been made pursuant to (2) during the reporting period, the report shall so indicate.
- (3) An application for a specific license authorizing the incorporation of NARM into gas and aerosol detectors to be distributed to persons exempt under ARM 37.14.506(3)(c) will be approved if the application satisfies requirements equivalent to those contained in 10 CFR Part 32, section 32.26.
- An application for а specific license manufacture or distribute devices containing radioactive material, excluding special nuclear material, to persons 37.14.512(4) or under ARM generally licensed equivalent regulations of the US nuclear regulatory commission, agreement state or a licensing state will be approved if:
- (i) the applicant satisfies the general requirements of ARM 37.14.521;
- (ii) the applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control, labels, proposed uses, installation, servicing, leak testing, operating and safety instructions, and potential hazards of the device to provide reasonable assurance that:
- (A) the device can be safely operated by persons not having training in radiological protection,
- (B) under ordinary conditions of handling, storage, and use of the device, the radioactive material contained in the device will not be released or inadvertently removed from the device, and it is unlikely that any person will receive in any period of 1 calendar quarter a dose in excess of 10% of the limits specified in the table in ARM 37.14.705(1), and

(C) under accident conditions (such as fire and explosion) associated with handling, storage, and use of the device, it is unlikely that any person would receive an external addition dose or dose commitment in excess of the following organ doses:

Whole body; head and trunk; active blood-forming organs; gonads; or lens of eye

15 rams

Hands and forearms; feet and ankles; 200 rams localized areas of skin averaged over areas no larger than 1 square centimeter

Other organs

50 rams

- (iii) each device bears a durable, legible, clearly visible label or labels approved by the department, which contain in a clearly identified and separate statement:
- (A) instructions and precautions necessary to assure safe installation, operation, and servicing of the device (documents such as operating and service manuals may be identified in the label and used to provide this information),
- (B) the requirement, or lack of requirement, for leak testing, or for testing any on/off mechanism and indicator, including the maximum time interval for such testing, and the identification of radioactive material by isotope, quantity of radioactivity, and date of determination of the quantity, and
- (C) the information called for in 1 of the following statements, as appropriate, in the same or substantially similar form:
- (I) The receipt, possession, use and transfer of this device, Model \_\_\_\_\_, Serial No. \_\_\_\_\_, are subject to a general license or the equivalent and the regulations of the US nuclear regulatory commission or a state with which the US nuclear regulatory commission has entered into an agreement for the exercise of regulatory authority. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

CAUTION--RADIOACTIVE MATERIAL

(Name of manufacturer or distributor)

#### 37.14.542

### DEPARTMENT OF PUBLIC HEALTH AND HUMAN SERVICES

The receipt, possession, use, and transfer of this (II)device, Model \_\_\_\_\_, Serial No. \_\_\_\_\_, are subject to a general license or the equivalent, and the regulations of a licensing state. This label shall be maintained on the device in a legible condition. Removal of this label is prohibited.

#### CAUTION--RADIOACTIVE MATERIAL

(Name of manufacturer or distributor)

- (D) The model, serial number, and name of the manufacturer or distributor may be omitted from the foregoing label provided the information is elsewhere specified in labeling affixed to the device.
- In the event the applicant desires that the device be (b) required to be tested at intervals longer than 6 months, either for proper operation of the on/off mechanism and indicator, if any, or for leakage of radioactive material or for both, he shall include in his application sufficient information to demonstrate that such longer interval is justified performance characteristics of the device or similar devices and by design features which have a significant bearing on the probability or consequences of leakage of radioactive material from the device or failure of the on/off mechanism and indicator. In determining the acceptable interval for the test for leakage of radioactive material, the department will consider information which includes, but is not limited to:
  - primary containment (source capsule);
  - protection of primary containment;
  - (iii) method of sealing containment;
  - (iv) containment construction material;
  - (v) form of contained radioactive material;
  - (vi) maximum temperature withstood during prototype tests;
  - (vii) maximum pressure withstood during prototype tests;
  - (viii) maximum quantity of contained radioactive material;
  - (ix) radiotoxicity of contained radioactive material; and
- operating experience with identical devices or similarly designed and constructed devices.

- In the event the applicant desires that the general license under ARM 37.14.512(4) or under equivalent regulations of the US nuclear regulatory commission, an agreement state or a licensing state be authorized to install the device, collect the sample to be analyzed by a specific licensee for leakage of radioactive material, service the device, test the on/off mechanism and indicator, or remove the device from installation, he shall include in his application written instructions to be followed by the general licensee, estimated calendar quarter doses associated with such activity or activities, and bases for The submitted information shall demonstrate such estimates. that performance of such activity or activities by an individual untrained in radiological protection, in addition to other handling, storage, and use of devices under the general license, is unlikely to cause that individual to receive a calendar quarter dose in excess of 10% of the limits specified in the table in ARM 37.14.705(2).
- (d) Each person licensed under (4) to distribute devices to generally licensed persons shall:
- (i) Furnish a copy of the general license contained in ARM 37.14.512(4) to each person to whom he directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license contained in ARM 37.14.512(4).
- (ii) Furnish a copy of the general license contained in the US nuclear regulatory commission's, agreement state's or licensing state's regulation equivalent to ARM 37.14.512(4) or alternatively, furnish a copy of the general license contained in ARM 37.14.512(4), to each person to whom he directly or through an intermediate person transfers radioactive material in a device for use pursuant to the general license of the US nuclear regulatory commission, the agreement or the licensing state. If a copy of the general license in ARM 37.14.512(4) is furnished to such person, it shall be accompanied by a note explaining that the use of the device is regulated by the US nuclear regulatory commission, agreement state or licensing state under requirements substantially the same as those in ARM 37.14.512(4).

- Report to the department all transfers of such (iii) devices to persons for use under the general license in ARM 37.14.512(4). Such report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model number of transferred, and the quantity and type of radioactive material contained in the device. If 1 or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. If no transfers have been made to persons generally licensed under 37.14.512(4) during the reporting period, the report shall so The report shall cover each calendar quarter and indicate. shall be filed within 30 days thereafter.
  - (iv) Reports to other agencies include:
- (A) Report to the US nuclear regulatory commission all transfers of such devices to persons for use under the US nuclear regulatory commission general license.
- (B) Report to the responsible state agency all transfers of devices manufactured and distributed pursuant to ARM 37.14.542(4) for use under a general license in that state's regulations equivalent to ARM 37.14.512(4).
- (C) Such reports shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model of the device transferred, and the quantity and type of radioactive material contained in the device. If 1 or more intermediate persons will temporarily possess the device at the intended place of use prior to its possession by the user, the report shall include identification of each intermediate person by name, address, contact, and relationship to the intended user. The report shall be submitted within 30 days after the end of each calendar quarter in which such a device is transferred to the generally licensed person.
- (D) If no transfers have been made to US nuclear regulatory commission licensees during the reporting period, this information shall be reported to the US nuclear regulatory commission.
- (E) If no transfers have been made to general licensees within a particular state during the reporting period, this information shall be reported to the responsible state agency upon request of the agency.

- (5) An application for a specific license to manufacture, assemble, or repair luminous safety devices containing tritium or promethium-147 for use in aircraft, for distribution to persons generally licensed under ARM 37.14.512(5) will be approved subject to the following conditions:
- (a) The applicant satisfies the general requirements specified in ARM 37.14.521, and
- (b) the applicant satisfies the requirements of 10 CFR Part 32, sections 32.53, 32.54, 32.55, 32.56, 32.101, or their equivalent.
- (6) An application for a specific license to manufacture calibration and reference sources containing americium-241, plutonium or radium-226 to persons generally licensed under ARM 37.14.512(7) will be approved subject to the following conditions:
- (a) The applicant satisfies the general requirement of ARM 37.14.521 and
- (b) the applicant satisfies the requirements of 10 CFR Part 32, sections 32.57, 32.58, 32.59, 32.102, and 10 CFR Part 70, section 70.39, or their equivalent.
- (7) In addition to requirements set forth in ARM 37.14.521, a specific license authorizing the distribution of radioactive material for use by physicians under the general license in ARM 37.14.512(8) will be issued if:
- (a) the applicant submits evidence that the radioactive material is to be manufactured, labeled, and packaged in accordance with a new drug application which the commissioner of food and drugs, food and drug administration, has approved, or in accordance with a license for a biologic product issued by the secretary, department of health, education, and welfare; and
- (b) one of the following statements, as appropriate, or a substantially similar statement which contains the information called for in 1 of the following statements, appears on the label affixed to the container or appears in the leaflet or brochure which accompanies the package:
- (i) This radioactive drug may be received, possessed, and used only by physicians licensed in the practice of medicine. Its receipt, possession, use and transfer are subject to the regulations and a general license or its equivalent of the US nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

(Name of manufacturer)

(ii) This radioactive drug may be received, possessed, and used only by physicians licensed in the practice of medicine. Its receipt, possession, use and transfer are subject to the regulations and a general license or its equivalent of a licensing state.

### (Name of manufacturer)

- (8) An application for a specific license to manufacture or distribute radioactive material for use under the general license of ARM 37.14.512(9) will be approved if:
- (a) The applicant satisfies the general requirements specified in ARM 37.14.521.
- (b) The radioactive material is to be prepared for distribution in prepackaged units of:
  - (i) Iodine-125 in units not exceeding 10 microcuries each.
- (ii) Iodine-131 in units not exceeding 10 microcuries each.
- (iii) Carbon-14 in units not exceeding 10 microcuries each.
- (iv) Hydrogen-3 (tritium) in units not exceeding 50 microcuries each.
  - (v) Iron-59 in units not exceeding 20 microcuries each.
  - (vi) Cobalt-57 in units not exceeding 10 microcuries each.
- (vii) Selenium-75 in units not exceeding 10 microcuries each.
- (viii) Mock iodine-125 in units not exceeding 0.05 microcurie of iodine-129 and 0.005 microcurie of americium-241 each.
- (c) Each prepackaged unit bears a durable, clearly visible label:
- (i) identifying the radioactive contents as to chemical form and radionuclide, and indicating that the amount of radioactivity does not exceed 10 microcuries of iodine-125, iodine-131, carbon-14, cobalt-57, or selenium-75; 50 microcuries of hydrogen-3 (tritium); 20 microcuries of iron-59; or mock iodine-125 in units not exceeding 0.05 microcurie of iodine-129 and 0.005 microcurie of americium-241 each; and
- (ii) displaying the radiation caution symbol described in ARM 37.14.725(1)(a) and the words, "CAUTION--RADIOACTIVE MATERIAL", and "Not for Internal or External Use in Humans or Animals".
- (d) One of the following statements, as appropriate, or a substantially similar statement which contains the information called for in 1 of the following statements, appears on a label affixed to each prepackaged unit or appears in a leaflet or brochure which accompanies the package:

(i) This radioactive material may be received, acquired, possessed, and used only by physicians, clinical laboratories or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of the US nuclear regulatory commission or of a state with which the commission has entered into an agreement for the exercise of regulatory authority.

### (Name of manufacturer)

(ii) This radioactive material may be received, acquired, possessed, and used only by physicians, clinical laboratories or hospitals and only for in vitro clinical or laboratory tests not involving internal or external administration of the material, or the radiation therefrom, to human beings or animals. Its receipt, acquisition, possession, use, and transfer are subject to the regulations and a general license of a licensing state.

### (Name of manufacturer)

- (e) The label affixed to the unit, or the leaflet or brochure which accompanies the package, contains adequate information as to the precautions to be observed in handling and storing such radioactive material. In the case of the mock iodine-125 reference or calibration source, the information accompanying the source must also contain directions to the licensee regarding the waste disposal requirements set out in ARM 37.14.740.
- (9) An application for a specific license to manufacture and distribute ice detection devices to persons generally licensed under ARM 37.14.512(10) will be approved subject to the following conditions:
- (a) the applicant satisfies the general requirements of ARM 37.14.521, and
- (b) the criteria of 10 CFR Part 32, sections 32.61, 32.62, 32.103, are met.
- (10) An application for a specific license to manufacture and distribute radiopharmaceuticals containing radioactive material for use by persons licensed pursuant to ARM 37.14.540(3) for the uses listed in Group I, Group II, IV, or V of Schedule C of this subchapter will be approved if:
- (a) The applicant satisfies the general requirements specified in ARM 37.14.521;

- (b) The applicant submits evidence that:
- (i) the radiopharmaceutical containing radioactive material will be manufactured, labeled, and packaged in accordance with the federal Food, Drug and Cosmetic Act or the Public Health Service Act, such as a new drug application (NDA) approved by the food and drug administration (FDA), a biologic product license issued by FDA or a "Notice of claimed investigational exemption for a new drug" (IND) that has been accepted by the FDA, or
- (ii) the manufacture and distribution of the radiopharmaceutical containing radioactive material is not subject to the federal Food, Drug and Cosmetic Act and the Public Health Service Act;
- (c) The applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material which is appropriate for safe handling and storage of radiopharmaceuticals by group licensees; and
- each package (d)(i) The label affixed to radiopharmaceutical contains information on the radionuclide, quantity, and date of assay and the label affixed to each package, or the leaflet or brochure which accompanies each package, contains a statement that the radiopharmaceutical is licensed by the department for distribution to persons licensed pursuant to ARM 37.14.540(3) and Schedule C, Group I, Group II, Group IV, and Group V of this subchapter, as appropriate, or equivalent licenses of the US nuclear under commission, an agreement state or a licensing state.
- (ii) The labels, leaflets or brochures required by (d)(i) above are in addition to the labeling required by the food and drug administration (FDA) and they may be separate from or, with the approval of FDA, may be combined with the labeling required by FDA.
- (11) An application for a specific license to manufacture and distribute generators or reagent kits containing radioactive material for preparation of radiopharmaceuticals by persons licensed pursuant to ARM 37.14.540(3) for the uses listed in Group II of Schedule C of this subchapter will be approved if:
- (a) The applicant satisfies the general requirements specified in ARM 37.14.521;
  - (b) the applicant submits evidence that:
- (i) the generator or reagent kit is to be manufactured, labeled and packaged in accordance with the federal Food, Drug and Cosmetic Act or the Public Health Service Act, such as a new drug application (NDA) approved by the food and drug administration (FDA), a biologic product license issued by FDA, or a "Notice of claimed investigational exemption for a new drug" (IND) that has been accepted by the FDA, or

- (ii) the manufacture and distribution of the generator or reagent kit are not subject to the federal Food, Drug and Cosmetic Act and the Public Health Service Act;
- (c) the applicant submits information on the radionuclide, chemical and physical form, packaging including maximum activity per package, and shielding provided by the packaging of the radioactive material contained in the generator or the reagent kit;
- (d) the label affixed to the generator or reagent kit contains information on the radionuclide, quantity, and date of assay; and
- (e) the label affixed to the generator or reagent kit, or the leaflet or brochure which accompanies the generator or reagent kit, contains:
- (i) adequate information, from a radiation safety standpoint, on the procedures to be followed and the equipment and shielding to be used in elating the generator or processing radioactive material with the reagent kit, and
- (ii) a statement that this generator or reagent kit (as appropriate) is approved for use by persons licensed by the department pursuant to ARM 37.14.540(3) and Schedule C, Group III of this subchapter or under equivalent licenses of the US nuclear regulatory commission, an agreement state or a licensing state. The labels, leaflets or brochures required by (11) are in addition to the labeling required by FDA and they may be separate from or, with the approval of FDA, may be combined with the labeling required by FDA.
- NOTE: Although the department does not regulate the manufacture and distribution of reagent kits that do not contain radioactive material, it does regulate the use of such reagent kits for the preparation of radio pharmaceuticals containing radioactive material as part of its licensing and regulation of the users of radioactive material. Any manufacturer of reagent kits that do not contain radioactive material who desires to have his reagent kits approved by the department for use by persons licensed pursuant to ARM 37.14.540(3) and Group III of Schedule C of this subchapter may submit the pertinent information specified in (11).
- (12) An application for a specific license to manufacture and distribute sources and devices containing radioactive material to persons licensed pursuant to ARM 37.14.540(3) for use as a calibration or reference source or for the uses listed in Group VI of Schedule C of this subchapter will be approved if:
- (a) The applicant satisfies the general requirements in ARM 37.14.521.

- (b) The applicant submits sufficient information regarding each type of source or device pertinent to an evaluation of its radiation safety, including:
- (i) the radioactive material contained, its chemical and physical form, and amount,
- (ii) details of design and construction of the source or device,
- (iii) procedures for, and results of, prototype tests to demonstrate that the source or device will maintain its integrity under stresses likely to be encountered in normal use and accidents,
- (iv) for devices containing radioactive material, the radiation profile of a prototype device,
- (v) details of quality control procedures to assure that production sources and devices meet the standards of the design and prototype tests,
- $\left( \text{vi} \right)$  procedures and standards for calibrating sources and devices,
- (vii) legend and methods for labeling sources and devices as to their radioactive content, and
- (viii) instructions for handling and storing the source or device from the radiation safety standpoint; these instructions are to be included on a durable label attached to the source or device or attached to a permanent storage container for the source or device; provided, that instructions which are too lengthy for such label may be summarized on the label and printed in detail on a brochure which is referenced on the label.
- (c) The label affixed to the source or device, or to the permanent storage container for the source or device, contains information on the radionuclide, quantity, and date of assay, and a statement that the name of source or device is licensed by the department for distribution to persons licensed pursuant to ARM 37.14.540(3) and Schedule C, Group VI of this subchapter or under equivalent licenses of the US nuclear regulatory commission, an agreement state or a licensing state, provided, that such labeling for sources which do not require long term storage (e.g., gold-198 seeds) may be on a leaflet or brochure which accompanies the source.
- (d) In the event the applicant desires that the source or device be required to be tested for leakage of radioactive material at intervals longer than 6 months, he shall include in his application sufficient information to demonstrate that such longer interval is justified by performance characteristics of the source or device or similar sources or devices and by design features that have a significant bearing on the probability or consequences of leakage of radioactive material from the source.

- (e) In determining the acceptable interval for test of leakage of radioactive material, the department will consider information that includes, but is not limited to:
  - (i) primary containment (source capsule),
  - (ii) protection of primary containment,
  - (iii) method of sealing containment,
  - (iv) containment construction materials,
  - (v) form of contained radioactive material,
  - (vi) maximum temperature withstood during prototype tests,
  - (vii) maximum pressure withstood during prototype tests,
  - (viii) maximum quantity of contained radioactive material,
  - (ix) radiotoxicity of contained radioactive material, and
- (x) operating experience with identical sources or devices or similarly designed and constructed sources or devices.
- (13) Requirements for license to manufacture and distribute industrial products containing depleted uranium for mass-volume applications.
- (a) An application for a specific license to manufacture industrial products and devices containing depleted uranium for use pursuant to ARM 37.14.511(4) or equivalent regulations of the US nuclear regulatory commission or an agreement state will be approved if:
- (i) the applicant satisfies the general requirements specified in ARM 37.14.521;
- (ii) the applicant submits sufficient information relating to the design, manufacture, prototype testing, quality control procedures, labeling or marking, proposed uses, and potential hazards of the industrial product or device to provide reasonable assurance that possession, use, or transfer of the depleted uranium in the product or device is not likely to cause any individual to receive in any period of 1 calendar quarter a radiation dose in excess of 10% of the limits specified in ARM 37.14.705(2); and
- (iii) the applicant submits sufficient information regarding the industrial product or device and the presence of depleted uranium for a mass-volume application in the product or device to provide reasonable assurance that unique benefits will accrue to the public because of the usefulness of the product or device.
- (b) In the case of an industrial product or device whose unique benefits are questionable, the department will approve an application for a specific license under (13) only if the product or device is found to combine a high degree of utility and low probability of uncontrolled disposal and dispersal of significant quantities of depleted uranium into the environment.
- (c) The department may deny any application for a specific license under (13) if the end use(s) of the industrial product or device cannot be reasonably foreseen.

- (d) Each person licensed pursuant to (a) above shall:
- (i) maintain the level of quality control required by the license in the manufacture of the industrial product or device, and in the installation of the depleted uranium into the product or device;
  - (ii) label or mark each unit to:
- (A) identify the manufacturer of the product or device and the number of the license under which the product or device was manufactured, the fact that the product or device contains depleted uranium, and the quantity of depleted uranium in each product or device; and
- (B) state that the receipt, possession, use, and transfer of the product or device are subject to a general license or the equivalent and the regulations of the US nuclear regulatory commission or of an agreement state;
- (iii) assure that the depleted uranium before being installed in each product or device has been impressed with the following legend clearly legible through any plating or other covering: "Depleted Uranium";
- (iv)(A) furnish a copy of the general license contained in ARM 37.14.511(4) and a copy of department form MRH-12 to each person to whom he transfers depleted uranium in a product or device for use pursuant to the general license contained in ARM 37.14.511(4), or
- furnish a copy of the general license contained in the (B) nuclear regulatory commission's or agreement state's regulation equivalent to ARM 37.14.511(4) and a copy of the US regulatory commission's agreement or certificate, or alternatively, furnish a copy of the general license contained in ARM 37.14.511(4) and a copy of department form MRH-12 to each person to whom he transfers depleted uranium in a product or device for use pursuant to the general license of the US nuclear regulatory commission or an agreement state, with a note explaining that use of the product or device is regulated by the US nuclear regulatory commission or agreement state under requirements substantially the same as those in ARM 37.14.511(4);

- (v) report to the department all transfers of industrial products or devices to persons for use under the general license in ARM 37.14.511(4). Such report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the department and the general licensee, the type and model number of device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within 30 days after the end of each calendar quarter in which such a product or device is transferred to the generally licensed person. If no transfers have been made to persons generally licensed under ARM 37.14.511(4) during the reporting period, the report shall so indicate;
- (vi)(A) report to the US nuclear regulatory commission all transfers of industrial products or devices to persons for use under the US nuclear regulatory commission general license,
- (B) report to the responsible state agency all transfers of devices manufactured and distributed pursuant to (13) for use under a general license in that state's regulations equivalent to ARM 37.14.511(4),
- (C) such report shall identify each general licensee by name and address, an individual by name and/or position who may constitute a point of contact between the agency and the general licensee, the type and model number of the device transferred, and the quantity of depleted uranium contained in the product or device. The report shall be submitted within 30 days after the end of each calendar quarter in which such product or device is transferred to the generally licensed person,
- (D) if no transfers have been made to US nuclear regulatory commission licensees during the reporting period, this information shall be reported to the US nuclear regulatory commission,
- (E) if no transfers have been made to general licensees within a particular agreement state during the reporting period, this information shall be reported to the responsible agreement state agency; and
- (vii) keep records showing the name, address, and point of contact for each general licensee to whom he transfers depleted uranium in industrial products or devices for use pursuant to the general license provided in ARM 37.14.511(4) or equivalent regulations of the US nuclear regulatory commission or of an agreement state. The records shall be maintained for a period of 2 years and shall show the date of each transfer, the quantity of depleted uranium in each product or device transferred, and compliance with the report requirements of this subchapter. (History: Sec.75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

37.14.543 SPECIFIC LICENSES: PERSONS POSSESSING A LICENSE FOR SOURCE, BYPRODUCT, OR SPECIAL NUCLEAR MATERIAL IN QUANTITIES NOT SUFFICIENT TO FORM A CRITICAL MASS (1) Any person who, on the effective date of this chapter, possesses a general or specific license for source, byproduct, or special nuclear material in quantities not sufficient to form a critical mass, issued by the US nuclear regulatory commission, shall be deemed to possess a like license issued under this subchapter and the act, such license to expire either 90 days after receipt from the department of a notice of expiration of such license, or on the date of expiration specified in the US nuclear regulatory commission license, whichever is earlier. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 44 and 45 reserved

37.14.546 EXISTING SPECIFIC LICENSES: NARM (1) Any person who, on the effective date of this chapter, possesses NARM for which a specific license is required by the act or this subchapter shall be deemed to possess such a license issued under the act and this subchapter. Such license shall expire 90 days after the effective date of this chapter; provided, however, that if within the 90 days the person possessing such material files an application in proper form for a license, such existing license shall not expire until the application has been finally determined by the department. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

## 37.14.547 SPECIFIC LICENSES: TRANSFER OF MATERIAL

- (1) No licensee shall transfer radioactive material except as authorized pursuant to this rule.
- (2) Except as otherwise provided in his license and subject to the provisions of (3) and (4) of this rule, any licensee may transfer radioactive material:
- (a) to the department. A licensee may transfer material to the department only after receiving prior approval from the department;
  - (b) to the US department of energy;
- (c) to any person exempt from the provisions of this subchapter to the extent permitted under such exemption;
- (d) to any person authorized to receive such material under terms of a general license or its equivalent, or a specific license or equivalent licensing document, issued by the department, the US nuclear regulatory commission, any agreement state or any licensing state, or to any person otherwise authorized to receive such material by the federal government or any agency thereof, the department, any agreement state or any licensing state; or
  - (e) as otherwise authorized by the department in writing.
- (3) Before transferring radioactive material to a specific licensee of the department, the US nuclear regulatory commission, an agreement state or a licensing state, or to a general licensee who is required to register with the department, the US nuclear regulatory commission, an agreement state or a licensing state prior to receipt of the radioactive material, the licensee transferring the material shall verify that the transferee's license authorizes the receipt of the type, form, and quantity of radioactive material to be transferred.
- (4) The following methods for the verification required by(3) of this rule are acceptable:
- (a) The transferor may have in his possession, and read, a current copy of the transferee's specific license or registration certificate;

- (b) the transferor may have in his possession a written certification by the transferee that he is authorized by license or registration certificate to receive the type, form and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date;
- (c) for emergency shipments the transferor may accept oral certification by the transferee that he is authorized by license or registration certificate to receive the type, form, and quantity of radioactive material to be transferred, specifying the license or registration certificate number, issuing agency, and expiration date; provided, that the oral certification is confirmed in writing within 10 days;
- (d) the transferor may obtain other sources of information compiled by a reporting service from official records of the department, the US nuclear regulatory commission, the licensing agency of an agreement state or a licensing state as to the identity of licensees and the scope and expiration dates of licenses and registration; or
- (e) when none of the methods of verification described in (a), (b), (c), or (d) above are readily available or when a transferor desires to verify that information received by 1 of such methods is correct or up-to-date, the transferor may obtain and record confirmation from the department, the US nuclear regulatory commission, or the licensing agency of an agreement state or a licensing state that the transferee is licensed to receive the radioactive material.
- (5) Preparation for shipment and transport of radioactive material shall be in accordance with the provisions of ARM 37.14.552. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 48 and 49 reserved

- 37.14.550 SPECIFIC LICENSES: MODIFICATION, REVOCATION, AND TERMINATION (1) The terms and conditions of all licenses shall be subject to amendment, revision, or modification or the license may be suspended or revoked by reason of amendments to the act, or by reason of rules and orders issued by the department.
- (2) Any license may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application or any statement of fact required under provisions of the act, or because of conditions revealed by such application or statement of fact or any report, record, or inspection or other means which would warrant the department to refuse to grant a license on an original application, or for violation of, or failure to observe any of the terms and conditions of the act, or of the license, or of any rule or order of the department.
- (3) Except in cases of willfulness or those in which the public health, interest or safety requires otherwise, no license shall be modified, suspended, or revoked unless, prior to the institution of proceedings therefor, facts or conduct which may warrant such action shall have been called to the attention of the licensee in writing and the licensee shall have been afforded an opportunity to demonstrate or achieve compliance with all lawful requirements.
- (4) The department may terminate a specific license upon request submitted by the licensee to the department in writing. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.551 RECIPROCITY (1) Subject to this chapter, any person who holds a specific license from the US nuclear regulatory commission or any agreement state or licensing state, and issued by the agency having jurisdiction where the licensee maintains an office for directing the licensed activity and at which radiation safety records are normally maintained, is hereby granted a general license to conduct the activities authorized in such licensing document within this state for a period not in excess of 180 days in any calendar year provided that:
- (a) the licensing document does not limit the activity authorized by such document to specified installations or locations;

- (b) the out-of-state licensee notifies the department in writing at least 3 days prior to engaging in such activity. Such notification shall indicate the location, period, and type of proposed possession and use within the state, and shall be accompanied by a copy of the pertinent licensing document. If, for a specific case, the 3-day period would impose an undue hardship on the out-of-state licensee, he may, upon application to the department, obtain permission to proceed sooner. The department may waive the requirement for filing additional written notifications during the remainder of the calendar year following the receipt of the initial notification from a person engaging in activities under the general license provided in (1).
- (c) the out-of-state licensee complies with all applicable rules of the department and with all the terms and conditions of his licensing document, except any such terms and conditions which may be inconsistent with applicable rules of the department;
- (d) the out-of-state licensee supplies such other information as the department may request; and
- (e) the out-of-state licensee shall not transfer or dispose of radioactive material possessed or used under the general license provided in (1) except by transfer to a person:
- (i) specifically licensed by the department or by the US nuclear regulatory commission to receive such material, or
- (ii) exempt from the requirements for a license for such material under ARM 37.14.506(1).
- (2) Notwithstanding the provisions of (1) of this rule, any person who holds a specific license issued by the US nuclear regulatory commission or an agreement state authorizing the holder to manufacture, transfer, install, or service a device described in ARM 37.14.512(4)(a) within areas subject to the jurisdiction of the licensing body is hereby granted a general license to install, transfer, demonstrate or service such a device in this state provided that:
- (a) such person shall file a report with the department within 30 days after the end of each calendar quarter in which any device is transferred to or installed in this state. Each such report shall identify each general licensee to whom such device is transferred by name and address, the type of device transferred, and the quantity and type of radioactive material contained in the device;
- (b) the device has been manufactured, labeled, installed, and serviced in accordance with applicable provisions of the specific license issued to such person by the US nuclear regulatory commission or an agreement state;

- (c) such person shall assure that any labels required to be affixed to the device under regulations of the authority which licensed manufacture of the device bear a statement that "Removal of this label is prohibited"; and
- (d) the holder of the specific license shall furnish to each general licensee to whom he transfers such device or on whose premises he installs such device a copy of the general license contained in ARM 37.14.512(4).
- (3) The department may withdraw, limit, or qualify its acceptance of any specific license or equivalent licensing document issued by another agency, or any product distributed pursuant to such licensing document, upon determining that such action is necessary in order to prevent undue hazard to public health and safety or property. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-101 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### 37.14.552 TRANSPORTATION: PREPARATION OF MATERIAL

- For the purposes of this rule, a licensee who transports his own licensed material as a private carrier is considered to have delivered such material to a carrier for transport.
- (2) No licensee shall deliver any radioactive material to a carrier for transport, unless:
- (a) the licensee complies with the applicable requirements of the regulations, appropriate to the mode of transport, of the US department of transportation insofar as such regulations relate to the packaging of radioactive material, and to the monitoring, marking and labeling of those packages;
- the licensee has established procedures for opening closing packages in which radioactive material transported to provide safety and to assure that, prior to the delivery to a carrier for transport, each package is properly closed for transport; and
- prior to delivery of a package to a carrier for (C) transport, the licensee shall assure that any instructions needed to safely open the package are sent to or have been available to the consignee.
- Section (2) of this rule shall not apply to the transportation of licensed material, or to the delivery of licensed material to a carrier for transport, where such transportation is subject to the regulations of the US department of transportation or the US postal service. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### RADIATION CONTROL

### SCHEDULE A

### EXEMPT CONCENTRATIONS

Element (atomic number)	Isotope	Column I Gas Concentration  µCi/ml¹	Column II Liquid & Solid Concentration µCi/ml <sup>2</sup>
Antimony (51)	Sb-122		$3x10^{-4}$
	Sb-124		$2x10^{-4}$
Array (10)	Sb-125 Ar-37	$1x10^{-3}$	$1x10^{-3}$
Argon (18)	Ar-41	$4x10^{-7}$	
Arsenic (33)	As-73	TYTO	$5x10^{-3}$
TILBUILLE (33)	As-74		$5x10^{-4}$
	As-76		$2x10^{-4}$
	As-77		$8x10^{-4}$
Barium (56)	Ba-131		$2x10^{-3}$
_ s s ( s o ,	Ba-140		$3x10^{-4}$
Beryllium (4)	Be-7		$2x10^{-2}$
Bismuth (83)	Bi-206		$4 \times 10^{-4}$
Bromine (35)	Br-82	$4x10^{-7}$	$3x10^{-3}$
Cadmium (48)	Cd-109		$2x10^{-3}$
	Cd-115m		$3x10^{-4}$
	Cd-115		$3x10^{-4}$
Calcium (20)	Ca-45		$9x10^{-5}$
	Ca-47	_	$5x10^{-4}$
Carbon (6)	C-14	$1 \times 10^{-6}$	$8x10^{-3}$
Cerium (58)	Ce-141		$9 \times 10^{-4}$
	Ce-143		$4 \times 10^{-4}$
	Ce-144		$1 \times 10^{-4}$
Cesium (55)	Cs-131		$2x10^{-2}$
	Cs-134m		$6x10^{-2}$
ol 1 ' (15)	Cs-134	2 12-7	$9x10^{-5}$
Chlorine (17)	Cl-38	$9x10^{-7}$	$4x10^{-3}$
Chromium (24)	Cr-51		$2x10^{-2}$ $5x10^{-3}$
Cobalt (27)	Co-57 Co-58		$1 \times 10^{-3}$
	Co-56 Co-60		$5x10^{-4}$
Copper (29)	Cu-64		$3x10^{-3}$
Dysprosium (66)	Dy-165		$4x10^{-3}$
Dysprosium (00)	Dy-166		$4x10^{-4}$

<sup>&</sup>lt;sup>1</sup> Values are given in Column I only for those materials normally used as gases.  $^2$   $\mu\text{C1/gm}$  for solids.

Element		Column I Gas Concentration	Column II Liquid & Solid Concentration
(atomic number)	Isotope	$\mu \text{Ci/ml}^1$	$\mu \text{Ci/ml}^2$
Erbium (68)	Er-169 Er-171		$9x10^{-4}$ $1x10^{-3}$
Europium (63)	Eu-152 Eu-155	$6 \times 10^{-4}$	(Tr=9.2 h) 2x10 <sup>-3</sup>
Fluorine (9) Gadolinium (64)	F-18 Gd-153 Gd-159	$2 \times 10^{-6}$	$8 \times 10^{-3}$ $2 \times 10^{-3}$ $8 \times 10^{-4}$
Gallium (31) Germanium (32) Gold (79)	Ga-72 Ge-71 Au-196 Au-198 Au-199		$4 \times 10^{-4}$ $2 \times 10^{-2}$ $2 \times 10^{-3}$ $5 \times 10^{-4}$ $2 \times 10^{-3}$
Hafnium (72)	Hf-181	<b>5</b> 10-6	$7x10^{-4}$
Hydrogen (1)	H-3	$5x10^{-6}$	$3x10^{-2}$ $1x10^{-2}$
Indium (49)	In-113m In-114m		$2x10^{-4}$
Iodine (53)	I-126	$3x10^{-9}$	$2x10^{-5}$
iodilic (55)	I-131	$3x10^{-9}$	$2x10^{-5}$
	I-132	$8x10^{-8}$	$6x10^{-4}$
	I-133	$1x10^{-8}$	$7x10^{-5}$
	I-134	$2x10^{-7}$	$1x10^{-3}$
Iridium (77)	Ir-190		$2x10^{-3}$
	Ir-192		$4x10^{-4}$
	Ir-194		$3x10^{-4}$
Iron (26)	Fe-55		$8x10^{-3}$
- ,	Fe-59		$6x10^{-4}$
Krypton (36)	Kr-85m	$1 \times 10^{-6}$	
, ,	Kr-85	$3x10^{-6}$	
Lanthanum (57)	La-140		$2x10^{-4}$
Lead (82)	Pb-203		$4x10^{-3}$
Lutetium (71)	Lu-177		$1x10^{-3}$
Manganese (25)	Mn-52		$3x10^{-4}$
<u> </u>	Mn-54		$1x10^{-3}$
	Mn-56		$1x10^{-3}$
Mercury (80)	Hg-197m		$2x10^{-3}$
<u> </u>	Hg-197		$3x10^{-3}$
	Hg-203		$2x10^{-4}$
Molybdenum (42)	Mo-99		$2x10^{-3}$
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 $<sup>^{\</sup>scriptsize 1}$  Values are given in Column I only for those materials normally used as gases.

 $<sup>^{2}</sup>$   $\mu$ C1/gm for solids.

Element		Column I Gas Concentration	Column II Liquid & Solid Concentration
(atomic number)	Isotope	$\mu  extsf{Ci}/ extsf{ml}^1$	μCi/ml <sup>2</sup>
_			
Neodymium (60)	Nd-147		$6x10^{-4}$
	Nd-149		$3x10^{-3}$
Nickel (28) Niobium	Ni-65		$1x10^{-3}$
(Columbium) (41)	Nb-95		$1x10^{-3}$
	Nb-97		$9x10^{-3}$
Osmium (76)	Os-185		$7x10^{-4}$
	Os-191m		$3x10^{-2}$
	Os-191		$2x10^{-3}$
	Os-193		$6x10^{-4}$
Palladium (46)	Pd-103		$3x10^{-3}$
	Pd-109		$9x10^{-4}$
Phosphorus (15)	P-32		$2x10^{-4}$
Platinum (78)	Pt-191		$1x10^{-3}$
	Pt-193m		$1x10^{-2}$
	Pt-197m		$1x10^{-2}$
	Pt-197		$1x10^{-3}$
Potassium (19)	K-42		$3x10^{-3}$
Praseodymium (59)	Pr-142		$3x10^{-4}$
	Pr-143		$5 \times 10^{-4}$
Promethium (61)	Pm-147		$2x10^{-3}$
	Pm-149		$4 \times 10^{-4}$
Rhenium (75)	Re-183		$6 \times 10^{-3}$
	Re-186		$9 \times 10^{-4}$
	Re-188		$6 \times 10^{-4}$
Rhodium (45)	Rh-103m		$1 \times 10^{-1}$
	Rh-105		$1 \times 10^{-3}$
Rubidium (37)	Rb-86		$7 \times 10^{-4}$
Ruthenium (44)	Ru-97		$4x10^{-3}$
	Ru-103		$8 \times 10^{-4}$
	Ru-105		$1 \times 10^{-3}$
	Ru-106		$1 \times 10^{-4}$
Samarium (62)	Sm-153		$8 \times 10^{-4}$
Scandium (21)	Sc-46		$4 \times 10^{-4}$
	Sc-47		$9 \times 10^{-4}$
	Sc-48		$3x10^{-4}$
Selenium (34)	Se-75		$3x10^{-3}$
Silicon (14)	Si-31		$9x10^{-3}$

<sup>&</sup>lt;sup>1</sup> Values are given in Column I only for those materials normally used as gases.  $^2$   $\mu\text{Cl/gm}$  for solids.

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml¹	Column II Liquid & Solid Concentration µCi/ml²
Silver (47)	Ag-105 Ag-110m Ag-111		$1 \times 10^{-3}$ $3 \times 10^{-4}$ $4 \times 10^{-4}$
Sodium (11) Strontium (38)	Na-24 Sr-85 Sr-89 Sr-91 Sr-92		$2 \times 10^{-3}$ $1 \times 10^{-3}$ $1 \times 10^{-4}$ $7 \times 10^{-4}$ $7 \times 10^{-4}$
Sulfur (16) Tantalum (73) Technetium (43)	S-35 Ta-182 Tc-96m Tc-96	9x10 <sup>-8</sup>	$6 \times 10^{-4}$ $4 \times 10^{-4}$ $1 \times 10^{-1}$ $1 \times 10^{-3}$
Tellurium (52)	Te-125m Te-127m Te-127 Te-129m Te-131m Te-132		$2 \times 10^{-3}$ $6 \times 10^{-4}$ $3 \times 10^{-3}$ $3 \times 10^{-4}$ $6 \times 10^{-4}$ $3 \times 10^{-4}$
Terbium (65) Thallium (81)	Tb-160 T1-200 T1-201 T1-202 T1-204		$4 \times 10^{-4}$ $4 \times 10^{-3}$ $3 \times 10^{-3}$ $1 \times 10^{-3}$ $1 \times 10^{-3}$
Thulium (69) Tin (50)	Tm-170 Tm-171 Sn-113 Sn-125		$5 \times 10^{-4}$ $5 \times 10^{-3}$ $9 \times 10^{-4}$ $2 \times 10^{-4}$
Tungsten (Wolfram) (74)	W-181		4x10 <sup>-3</sup>
Vanadium (23) Xenon (54)	W-187 V-48 Xe-131m Xe-133 Xe-135	$4x10^{-6}$ $3x10^{-6}$ $1x10^{-6}$	$7 \times 10^{-4}$ $3 \times 10^{-4}$
Ytterbium (70)	Yb-175	1710	1x10 <sup>-3</sup>

 $<sup>^{1}</sup>$  Values are given in Column I only for those materials normally used as gases.  $^{2}$   $\mu\text{C1/gm}$  for solids.

Element (atomic number)	Isotope	Column I Gas Concentration µCi/ml¹	Column II Liquid & Solid Concentration µCi/ml²
Yttrium (39)	Y-90 Y-91m Y-91 Y-92 Y-93		$2x10^{-4}$ $3x10^{-2}$ $3x10^{-4}$ $6x10^{-4}$ $3x10^{-4}$
Zinc (30)	Zn-65 Zn-69m Zn-69		$1 \times 10^{-3}$ $7 \times 10^{-4}$ $2 \times 10^{2}$
Zirconium (40)	Zr-95 Zr-97		$6 \times 10^{-4}$ $2 \times 10^{-4}$
Beta and/or gamma emitting radioactive material not listed above with half-life less than 3 years		$1 \times 10^{-10}$	1x10 <sup>-6</sup>

NOTE 1: Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing the concentrations in Schedule A the activity stated is that of the parent isotope and takes into account the daughters.

NOTE 2: For purposes of ARM 37.14.506 where there is involved a combination of isotopes, the limit for the combination should be derived as follows: determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in Schedule A for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

Concentration of Isotope A in Product + EXAMPLE: Exempt concentration of Isotope A

> Concentration of Isotope B in Product # 1 Exempt concentration of Isotope B

<sup>&</sup>lt;sup>1</sup> Values are given in Column I only for those materials normally used as gases.

 $<sup>^{2}</sup>$   $\mu$ C1/gm for solids.

### SCHEDULE B

# EXEMPT QUANTITIES

Radioactive Material	Microcuries
Antimony-122 (Sb 122)	100
Antimony 122 (SB 122) Antimony-124 (SB 124)	10
Antimony 121 (SB 121) Antimony-125 (SB 125)	10
Arsenic-73 (As 73)	100
Arsenic-74 (As 74)	10
Arsenic-76 (As 76)	10
Arsenic-77 (As 77)	100
Barium-131 (Ba 131)	10
Barium-133 (Ba 133)	10
Barium-133 (Ba 133) Barium-140 (Ba 140)	10
Bismuth-210 (Bi 210)	1
Bromine-82 (Br 82)	10
Cadmium-109 (Cd 109)	10
Cadmium-115m (Cd 115m)	10
Cadmium-115 (Cd 115)	100
Calcium-45 (Ca 45)	100
Calcium-47 (Ca 47)	10
Carbon-14 (C 14)	100
Carbon-14 (C 14) Cerium-141 (Ce 141)	100
Cerium-141 (Ce 141) Cerium-143 (Ce 143)	100
Cerium-143 (Ce 143) Cerium-144 (Ce 144)	100
Cesium-129 (Cs 129)	100
Cesium-131 (Cs 131)	1,000
	1,000
Cesium-134m (Cs 134m)	
Cesium-134 (Cs 134)	1
Cesium-135 (Cs 135)	10
Cesium-136 (Cs 136)	10
Cesium-137 (Cs 137)	10
Chlorine-36 (Cl 36)	10
Chlorine-38 (Cl 38)	10 1,000
Chromium-51 (Cr 51) Cobalt-57 (Co 57)	•
· · · · · · · · · · · · · · · · · · ·	100
Cobalt-58m (Co 58m)	10
Cobalt-58 (Co 58)	10
Cobalt-60 (Co 60)	1
Copper-64 (Cu 64)	100
Dysprosium-165 (Dy 165)	10
Dysprosium-166 (Dy 166)	100
Erbium-169 (Er 169)	100
Erbium-171 (Er 171)	100
Europium-152 (Eu 152)9.2h	100
Europium-152 (Eu 152)13 yr	1
Europium-154 (Eu 154)	1

Radioactive Material	M	<u>licrocuries</u>
Europium-155 (Eu 155) Fluorine-18 (F 18) Gadolinium-153 (Gd 153) Gadolinium-159 (Gd 159) Gallium-67 (Ga 67) Gallium-72 (Ga 72) Germanium-71 (Ge 71) Gold-198 (Au 198) Gold-199 (Au 199) Hafnium-181 (Hf 181) Holmium-166 (Ho 166) Hydrogen-3 (H 3) Indium-111 (In 111) Indium-113m (In 113m) Indium-115m (In 115m) Indium-15 (In 115) Iodine-123 (I 123) Iodine-125 (I 125) Iodine-126 (I 126) Iodine-129 (I 129) Iodine-131 (I 131) Iodine-132 (I 132) Iodine-134 (I 134) Iodine-135 (I 135) Iridium-194 (Ir 194) Iron-52 (Fe 52) Iron-55 (Fe 55) Iron-59 (Fe 59) Krypton-85 (Kr 85) Krypton-87 (Kr 87) Lanthanum-140 (La 140) Lutetium-177 (Lu 177) Manganese-52 (Mn 52) Manganese-54 (Mn 54) Manganese-56 (Mn 56)	M.	10 1,000 10 100 100 100 100 100 100 100
Mercury-197m (Hg 197m) Mercury-197 (Hg 197) Mercury-203 (Hg 203) Molybdenum-99 (Mo 99) Neodymium-147 (Nd 147) Neodymium-149 (Nd 149) Nickel-59 (Ni 59) Nickel-63 (Ni 63)		100 100 10 100 100 100 100
Nickel-65 (Ni 65) Niobium-93m (Nb 93m) ADMINISTRATIVE RULES OF MONTANA	3/31/00	100 10 37-2737

Radioactive Material	Microcuries
Niobium-95 (Nb 95)	10
Niobium-97 (Nb 97)	10
Osmium-185 (Os 185)	10
Osmium-191m (Os 191m)	100
Osmium-191 (Os 191)	100
Osmium-193 (Os 193)	100
Palladium-103 (Pd 103)	100
Palladium-109 (Pd 109)	100
Phosphorus-32 (P 32)	10
Platinum-191 (Pt 191)	100
Platinum-193m (Pt 193m)	100
Platinum-193 (Pt 193)	100
Platinum-197m (Pt 197m)	100
Platinum-197 (Pt 197)	100
Polonium-210 (Po 210)	0.1
Potassium-42 (K 42)	10
Potassium-43 (K 43)	10
Praseodymium-142 (Pr 142)	100
Praseodymium-143 (Pr 143)	100
Promethium-147 (Pm 147) Promethium-149 (Pm 149)	10 10
Radium-226 (Ra 226)	0.1
Rhenium-186 (Re 186)	100
Rhenium-188 (Re 188)	100
Rhodium-103m (Rh 103m)	100
Rhodium-105 (Rh 105)	100
Rubidium-81 (Rb 81)	10
Rubidium-86 (Rb 86)	10
Rubidium-87 (Rb 87)	10
Ruthenium-97 (Ru 97)	100
Ruthenium-103 (Ru 103)	10
Ruthenium-105 (Ru 105)	10
Ruthenium-106 (Ru 106)	1
Samarium-151 (Sm 151)	10
Samarium-153 (Sm 153)	100
Scandium-46 (Sc 46)	10
Scandium-47 (Sc 47)	100
Scandium-48 (Sc 48)	10
Selenium-75 (Se 75)	10
Silicon-31 (Si 31)	100
Silver-105 (Ag 105)	10
Silver-110m (Ag 110m)	1
Silver-111 (Ag 111)	100
Sodium-22 (Na 22)	10
Sodium-24 (Na 24)	10
Strontium-85 (Sr 85)	10
Strontium-89 (Sr 89)	1

Radioactive Material		Microcuries
Strontium-90 (Sr 90) Strontium-91 (Sr 91) Strontium-92 (Sr 92) Sulphur-35 (S 35) Tantalum-182 (Ta 182) Technetium-96 (Tc 96) Technetium-97m (Tc 97m) Technetium-97m (Tc 97m) Technetium-99m (Tc 99m) Technetium-99m (Tc 99m) Technetium-99 (Tc 99) Tellurium-125m (Te 125m) Tellurium-127m (Te 127m) Tellurium-127m (Te 127m) Tellurium-129m (Te 129m) Tellurium-129m (Te 129m) Tellurium-131m (Te 131m) Tellurium-132 (Te 132) Terbium-160 (Tb 160) Thallium-200 (Tl 200) Thallium-201 (Tl 201) Thallium-202 (Tl 202) Thallium-204 (Tl 204) Thulium-170 (Tm 170) Thulium-171 (Tm 171) Tin-113 (Sn 113) Tin-125 (Sn 125) Tungsten-187 (W 181) Tungsten-185 (W 185) Tungsten-187 (W 187) Vanadium-48 (V 48) Xenon-133 (Xe 133) Xenon-135 (Xe 135) Ytterbium-175 (Yb 175) Yttrium-90 (Y 90) Yttrium-91 (Y 91) Yttrium-92 (Y 92) Yttrium-93 (Y 93) Zinc-65 (Zn 65) Zinc-69m (Zn 69m) Zinc-69 (Zn 69) Zirconium-93 (Zr 93) Zirconium-97 (Zr 97)		0.1 10 10 100 100 100 100 100 100 100 10
Any radioactive material not listed than alpha emitting radioactive mate		0.1
ADMINISTRATIVE RULES OF MONTANA	3/31/00	37-2739
	•	

Note 1: For purposes of ARM 37.14.521 where there is involved a combination of isotopes, the limit for the combination should be derived as follows:

Determine the amount of each isotope possessed and 1,000 times the amount in Schedule B for each of those isotopes when not in combination. The sum of the ratios of those quantities may not exceed 1 (i.e., unity).

Example:

Amt. of Isotope A possessed + Amt. of Isotope B possessed # 1 1000 x Schedule B quantity for Isotope A for Isotope B

#### SCHEDULE C

#### GROUPS OF MEDICAL USES OF RADIOACTIVE MATERIAL

- Group I. Use of prepared radiopharmaceuticals for certain diagnostic studies involving measurements of uptake, dilution and excretion (does not include uses involving imaging and tumor localizations)
- (1) Iodine-131 as sodium iodide ( $Na^{131}I$ ) for measurement of thyroid uptake.
- (2) Iodine-125 as sodium iodide ( $Na^{125}I$ ) for measurement of thyroid uptake.
- (3) Iodine-131 as iodinated human serum albumin (IHSA) for determination of blood and blood plasma volume and for studies of cardiovascular function and protein turnover.
- (4) Iodine-125 as iodinated human serum albumin (IHSA) for determination of blood and blood plasma volume and for studies of cardiovascular function and protein turnover.
- (5) Iodine-131 as labeled rose bengal for liver function studies.
- (6) Iodine-125 as labeled rose bengal for liver function studies.
- (7) Iodine-131 as labeled fats or fatty acids for fat absorption studies.
- (8) Iodine-125 as labeled fats or fatty acids for fat absorption studies.
- (9) Iodine-131 as labeled iodopyracet, sodium iodohippurate, sodium diatrizoate, diatrizoate methylglucamine, sodium diprotrizoate, sodium acetrizoete, or sodium iothalamate for kidney function studies.

- (10) Iodine-125 as labeled iodopyracet, sodium iodohippurate, sodium diatrizoate, distrizoate methylglucamine, sodium diprotrizoate, sodium acetrizoate, or sodium iothalamate for kidney function studies.
- (11) Cobalt-57 as labeled cyanocobalamin for intestinal absorption studies.
- (12) Cobalt-58 as labeled cyanocobalamin for intestinal absorption studies.
- (13) Cobalt-60 as labeled cyanocobalamin for intestinal absorption studies.
- (14) Chromium-51 as sodium chromate for determination of red blood cell volume and studies of red blood cell survival time and gastrointestinal blood loss.
- (15) Chromium-51 as labeled human serum albumin for gastrointestinal protein loss studies.
- (16) Iron-59 as chloride, citrate, or sulfate for iron turnover studies.
- (17) Potassium-42 as chloride for potassium space determinations.
- (18) Sodium-24 as chloride for sodium space determinations.
- (19) Technetium-99m as pertechnetate for blood flow studies.
  - (20) Mercury as chlormerodrin for kidney function studies.
- (21) Any radioactive material in a radiopharmaceutical and for a diagnostic use involving measurements of uptake, dilution, or excretion for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA).
- (22) Iodine-123 as sodium iodide (NaI) for measurement of thyroid uptake.

# Group II. Use of prepared radiopharmaceuticals for diagnostic studies involving imaging and tumor localizations

- (1) Iodine-131 as sodium iodide for thyroid imaging.
- (2) Iodine-125 as sodium iodide for thyroid imaging.
- (3) Iodine-131 as iodinated human serum albumin (IHSA) for brain tumor localizations and cardiac imaging.
- (4) Iodine-131 as macroaggregated iodinated human serum albumin for lung imaging.
- (5) Iodine-131 as colloidal (microaggregated) iodinated human serum albumin for liver imaging.
  - (6) Iodine-131 as labeled rose bengal for liver imaging.
- (7) Iodine-131 as iodopyracet, sodium iodohippurate, sodium diatrizoate, diatrizoate methyglucamine, sodium diprotrizoate, or sodium acetrizoate for kidney imaging.
  - (8) Iodine-131 as sodium iodipamide for cardiac imaging.

- (9) Iodine-131 as iodinated human serum albumin (IHSA) for placenta localization.
  - (10) Chromium-51 as sodium chromate for spleen imaging.
- (11) Chromium-51 as labeled human serum albumin for placenta localization.
  - (12) Gold-198 in colloidal form for liver imaging.
- (13) Mercury-197 as labeled chlormerodrin for kidney and brain imaging.
- (14) Mercury-203 as labeled chlormerodrin for brain imaging.
- (15) Selenium-75 as labeled selenomethionine for pancreas imaging.
- (16) Strontium-85 as nitrate or chloride for bone imaging in patients with suspected or diagnosed cancer.
  - (17) Technetium-99m as pertechnetate for brain imaging.
  - (18) Technetium-99m as pertechnetate for thyroid imaging.
- (19) Technetium-99m as pertechnetate for salivary gland imaging.
- (20) Technetium-99m as pertechnetate for blood pool imaging, including placenta localization.
- (21) Technetium-99m as labeled sulfur colloid for liver, spleen, and bone marrow imaging.
- (22) Technetium-99m as labeled macroaggregated human serum albumin for lung imaging.
- (23) Any radioactive material in a radiopharmaceutical prepared from a reagent kit listed in (4) of Group III.
- (24) Any radioactive material in a radiopharmaceutical and for a diagnostic use involving imaging for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA).
  - (25) Fluorine-18 in solution for bone imaging.
  - (26) Strontium-87m for bone imaging.
- (27) Iodine-125 as fibrinogen for detection and monitoring of developing deep vein thrombosis.
- (28) Ytterbium-169 as labeled diethylenetriamine-pentaacetic acid (DTPA) for cistornography.
- (29) Iodine-123 as sodium iodide (NaI) for thyroid imaging.
- (30) Indium-113m as chloride for blood pool imaging, including placenta localization.

# Group III. Use of generators and reagent kits for the preparation and use of radiopharmaceuticals containing radioactive material for certain diagnostic uses

- (1) Molybdenum-99/technetium-99m generators for the elution of technetium-99m as pertechnetate for:
  - (i) brain imaging;
  - (ii) thyroid imaging;

- (iii) salivary gland imaging;
- (iv) blood pool imaging including placenta localization;
- (v) blood flow studies; and
- (vi) use with reagent kits for preparation and use of radiopharmaceuticals containing technetium-99m as provided in (4) and (5) of this group.
- (2) Yttrium-87/strontium-87m generators for the elution of strontium-87m for bone imaging.
- (3) Technetium-99m as pertechnetate for use with reagent kits for preparation and use of radiopharmaceuticals containing technetium-99m as provided in (4) and (5) of this group.
- (4) Reagent kits for preparation of technetium-99m labeled:
- (i) sulfur colloid for liver, spleen, and bone marrow imaging;
- (ii) iron-ascorbate-diethylenetriaminepentaacetic acid complex for kidney imaging;
- (iii) diethylenetriaminepentaacetic acid (Sn) for kidney imaging and kidney function studies;
- (iv) diethylenetriaminepentaacetic acid (Sn) for brain imaging;
  - (v) human serum albumin microspheres for lung imaging;
  - (vi) polyphosphates for bone imaging;
- (vii) macroaggregated human serum albumin for lung
  imaging;
  - (viii) distannous etidronate complex for bone imaging;
  - (ix) stannous pyrophosphate for bone and cardiac imaging;
  - (x) human serum albumin for heart blood pool imaging; and
  - (xi) medronate sodium for bone imaging.
- (5) Any generator or reagent kit for preparation and diagnostic use of a radiopharmaceutical containing radioactive material for which generator or reagent kit a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA).
- (6) Tin-113/indium-113m generators for the elution of indium-113m as chloride for:
  - (i) blood pool imaging including placenta localization.

# Group IV. Use of prepared radiopharmaceuticals for certain therapeutic uses that do not normally require hospitalization for purposes of radiation safety

- (1) Iodine-131 as iodide for treatment of hyperthyroidism and cardiac dysfunction.
- (2) Phosphorus-32 as soluble phosphate for treatment of polycythemia vera, leukemia, and bone metastases.
- (3) Phosphorus-32 as colloidal chromic phosphate for intracavitary treatment of malignant effusions.

Any radioactive material in a radiopharmaceutical and for a therapeutic use not normally requiring hospitalization for purposes of radiation safety for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA).

# Use of prepared radiopharmaceuticals for certain therapeutic uses that normally require hospitalization for purposes of radiation safety

- Gold-198 as colloid for intracavitary treatment of malignant effusions.
- (2) Iodine-131 as iodide for treatment of thyroid carcinoma.
- Any radioactive material in a radiopharmaceutical and for a therapeutic use normally requiring hospitalization for radiation safety reasons for which a "Notice of Claimed Investigational Exemption for a New Drug" (IND) has been accepted by the Food and Drug Administration (FDA).

### Group VI. Use of sources and devices containing radioactive material for certain medical uses

- (1) Americium-241 as a sealed source in a device for bone mineral analysis.
- (2) Cesium-137 encased in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer.
- (3) Cobalt-60 encased in needles and applicator cells for topical, interstitial, and intracavitary treatment of cancer.
- Gold-198 as seeds for interstitial treatment of (4)cancer.
- (5) Iodine-125 as a sealed source in a device for bone mineral analysis.
- (6) Iridium-192 as seeds encased in nylon ribbon for interstitial treatment of cancer.
- (7) Strontium-90 sealed in an applicator for treatment of superficial eye conditions.
- Radon-222 as seeds for topical, interstitial, and intracavitary treatment of cancer.
- Radium-226 as a sealed source for interstitial, and intracavitary treatment of cancer.
- Iodine-125 as seeds for interstitial treatment of cancer.

# SCHEDULE D

# LIMITS FOR BROAD LICENCES

Radioactive	Col. I	Col. II
Material	curies	curies
Antimony-122	1	0.01
Antimony-124	1	0.01
Antimony-125	1	0.01
Arsenic-73	10	0.1
Arsenic-74	1	0.01
Arsenic-76	1	0.01
Arsenic-77	10	0.1
Barium-131	10	0.1
Barium-140	1	0.01
Beryllium-7	10	0.1
Bismuth-210	0.1	0.001
Bromine-82	10	0.1
Cadmium-109	1	0.01
Cadmium-115m	1	0.01
Cadmium-115	10	0.1
Calcium-45	1	0.01
Calcium-47	10	0.1
Carbon-14	100	1.
Cerium-141	10	0.1
Cerium-143	10	0.1
Cerium-144	0.1	0.001
Cesium-131	100	1.
Cesium-134m	100	1.
Cesium-134	0.1	0.001
Cesium-135	1	0.01
Cesium-136	10	0.1
Cesium-137	0.1	0.001
Chlorine-36	1	0.01
Chlorine-38	100	1.
Chromium-51	100	1.
Cobalt-57	10	0.1
Cobalt 58m	100 1	1.
Cobalt-58 Cobalt-60	0.1	0.01
	10	0.001 0.1
Copper-64 Dysprosium-165	100	1.
Dysprosium-166	10	0.1
Erbium-169	10	0.1
Erbium-171	10	0.1
Europium-152 (9.2h)	10	0.1
Europium-152 (13 y)	0.1	0.001
Europium-154	0.1	0.001
Europium-155	1	0.01
Fluorine-18	100	1.
	-	

Radioactive	Col. I	Col. II
Material	curies	curies
Gadolinium-153	1 0.01	CULTED
Gadolinium-159	10	0.1
Gallium-72	10	0.1
Germanium-71	100	1.
Gold-198	10	0.1
Gold-199	10	0.1
Hafnium-181	1	0.01
Holmium-166	10	0.1
Hydrogen-3	100	1.
Indium-113m	100	1.
Indium-114m	1	0.01
	100	
Indium-115m Indium-115	1	1. 0.01
Iodine-125	0.1	0.001
Iodine-126	0.1	0.001
Iodine-129	0.1	0.001
Iodine-131	0.1	0.001
Iodine-132	10	0.1
Iodine-133	1	0.01
Iodine-134	10	0.1
Iodine-135	1	0.01
Iridium-192	1	0.01
Iridium-194	10	0.1
Iron-55	10	0.1
Iron-59	1	0.01
Krypton-85	100	1.
Krypton-87	10	0.1
Lanthanum-140	1	0.01
Lutetium-177	10	0.1
Manganese-52	1	0.01
Manganese-54	1	0.01
Manganese-56	10	0.1
Mercury-197m	10	0.1
Mercury-197	10	0.1
Mercury-203	1	0.01
Molybdenum-99	10	0.1
Neodymium-147	10	0.1
Neodymium-149	10	0.1
Nickel-59	10	0.1
Nickel-63	1	0.01
Nickel-65	10	0.1
Niobium-93m	1	0.01
Niobium-95	1	0.01
Niobium-97	100	1.
Osmium-185	1	0.01
Osmium-191m	100	1.
Osmium-191	10	0.1
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Radioactive	Col. I	Col. II
Material	curies	curies
Osmium-193	10	0.1
Palladium-103	10	0.1
Palladium-109	10	0.1
Phosphorus-32	1	0.01
Platinum-191	10	0.1
Platinum-193m	100	1.
Platinum-193	10	0.1
Platinum-197m	100	1.
Platinum-197	10	0.1
Polonium-210	0.1	0.0001
Potassium-42	1	0.01
Praseodymium-142	10	0.1
Praseodymium-143	10	0.1
Promethium-147	1	0.01
Promethium-149	10	0.1
Radium-226	0.01	0.0001
Rhenium-186	10	0.1
Rhenium-188	10	0.1
Rhodium-103m	1,000	10.
Rhodium-105	10	0.1
Rubidium-86	1	0.01
Rubidium-87	1	0.01
Ruthenium-97	100	1.
Ruthenium-103	1	0.01
Ruthenium-105	10	0.1
Ruthenium-106	0.1	0.001
Samarium-151	1	0.01
Samarium-153	10	0.1
Scandium-46	1	0.01
Scandium-47	10	0.1
Scandium-48	1	0.01
Selenium-75	1	0.01
Silicon-31	10	0.1
Silver-105	1	0.01
Silver-110m	0.1	0.001
Silver-111	10	0.1
Sodium-22	0.1	0.001
Sodium-24	1	0.01
Strontium-85m	1,000	10.
Strontium-85	1	0.01
Strontium-89	1	0.01
Strontium-90	0.01	0.0001
Strontium-91	10	0.1
Strontium-92	10	0.1
Sulphur-35	10	0.1
Tantalum-182 Technetium-96	1	0.01
	10	0.1
Technetium-97m	10	0.1

Radioactive	Col. I	Col. II
Material	curies	curies
Technetium-97	10	0.1
Technetium-99m	100	1.
Technetium-99	1	0.01
Tellurium-125m	1	0.01
Tellurium-127m	1	0.01
Tellurium-127	10	0.1
Tellurium-129m	1	0.01
Tellurium-129	100	1.
Tellurium-131m	10	0.1
Tellurium-132	1	0.01
Terbium-160	1	0.01
Thallium-200	10	0.1
Thallium-201	10	0.1
Thallium-202	10	0.1
Thallium-204	1	0.01
Thulium-170	1	0.01
Thulium-171	1	0.01
Tin-113	1	0.01
Tin-125	1	0.01
Tungsten-181	1	0.01
Tungsten-185	1	0.01
Tungsten-187	10	0.1
Vanadium-48	1	0.01
Xenon-131m	1,000	10.
Xenon-133	100	1.
Xenon-135	100	1.
Ytterbium-175	10	0.1
Yttrium-90	1	0.01
Yttrium-91	1	0.01
Yttrium-92	10	0.1
Yttrium-93	1	0.01
Zinc-65	1	0.01
Zinc-69m	10	0.1
Zinc-69	100	1.
Zirconium-93	1	0.01
Zirconium-95	1	0.01
Zirconium-97	1	0.01

Any radioactive material other than source material, special nuclear material, or alpha emitting radioactive material not listed above. 0.1 0.001

Subchapter 6 reserved

#### Subchapter 7

#### Standards for Protection Against Radiation

- 37.14.701 PURPOSE AND SCOPE (1) This subchapter establishes standards for protection against radiation hazards. Except as otherwise specifically provided, this subchapter applies to all licensees or registrants. Nothing in this subchapter shall be interpreted as limiting the intentional exposure of patients to radiation for the purpose of medical diagnosis or therapy.
- (2) In addition to complying with the requirements set forth in this subchapter, every reasonable effort should be made to maintain radiation exposures, and releases of radioactive material in effluents to unrestricted areas, as low as is reasonably achievable. The term "as low as is reasonably achievable" means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of ionizing radiation in the public interest. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 02 through 04 reserved

- 37.14.705 PERMISSIBLE DOSES, LEVELS AND CONCENTRATIONS: RADIATION DOSE TO INDIVIDUALS IN RESTRICTED AREAS (1) For determining the doses specified in this rule, a dose from X or gamma rays up to 10 MeV may be assumed to be equivalent to the exposure measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dose rate.
- (2) Except as provided in (3) of this rule, no licensee or registrant shall possess, use, receive, or transfer sources of radiation in such a manner as to cause any individual in a restricted area to receive in any period of 1 calendar quarter from all sources of radiation in the licensee's or registrant's possession a dose in excess of the limits specified in the following table:

#### Rems per calendar quarter

Whole body; head and trunk;
active blood-forming organs;
lens of eyes; or gonads 1 1/4
Hands and forearms; feet
and ankles
Skin of whole body 7 1/2

- (3) A licensee or registrant may permit an individual in a restricted area to receive a dose to the whole body greater than that permitted under (2) of this rule, provided:
- (a) during any calendar quarter the dose to the whole body from sources of radiation in the licensee's or registrant's possession shall not exceed 3 rems;
- (b) the dose to the whole body, when added to the accumulated occupational dose to the whole body, shall not exceed 5(N-18) rems where "N" equals the individual's age in years at his last birthday; and
- (c) the licensee or registrant has determined the individual's accumulated occupational dose to the whole body on department form MRH-30 or on a clear and legible record containing all the information required in that form and has otherwise complied with the requirements of ARM 37.14.706. As used in (3), "dose to the whole body" shall be deemed to include any dose to the whole body, gonads, active blood-forming organs, head and trunk, or lens of eye. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.706 PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS: DETERMINATION OF ACCUMULATED DOSE (1) This rule contains requirements which must be satisfied by licensees or registrants who propose, pursuant to ARM 37.14.705(3) to permit individuals in a restricted area to receive exposure to radiation in excess of the limits specified in ARM 37.14.705(2).
- (2) Before permitting any individual in a restricted area to be exposed to radiation in excess of the limits specified in ARM 37.14.705(2), each licensee or registrant shall:
- (a) obtain a certificate on department form MRH-30 or on a clear and legible record containing all the information required in that form, signed by the individual, showing each period of time after the individual attained the age of 18 in which the individual received an occupational dose of radiation; and
- (b) calculate on department form MRH-30, in accordance with the instructions appearing therein, or on a clear and legible record containing all the information required in that form, the previously accumulated occupational dose received by the individual and the additional dose allowed for that individual under ARM 37.14.705(3).
- (c) In the preparation of department form MRH-30, or a clear and legible record containing all the information required in that form, the licensee or registrant shall make a reasonable effort to obtain reports of the individual's previously accumulated occupational dose. For each period for which the licensee or registrant obtains such reports, he shall use the dose shown in the report in preparing the form. In any case where a licensee or registrant is unable to obtain reports of the individual's occupational dose for a previous complete calendar quarter, it shall be assumed that the individual has received the occupational dose specified in whichever of the following columns apply:

Column 1
Assumed Dose in Rems for Calendar
Quarters Prior to
January 1, 1961
3 3/4

Column 2
Assumed dose in Rems
for Calendar Quarters
Beginning on or after
January 1, 1961
1 1/4

Part of Body
Whole body,
gonads, active
blood-forming
organs,
head and trunk,
lens of eye

- (d) The licensee or registrant shall retain and preserve records used in preparing department form MRH-30 until the department authorizes their disposition. If calculation of the individual's accumulated occupational dose for all periods prior to January 1, 1961, yields a result higher than the applicable accumulated dose value for the individual as of that date, as specified in ARM 37.14.705(3)(b), the excess may be disregarded. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.707 PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS: EXPOSURE OF INDIVIDUALS TO CONCENTRATIONS OF RADIOACTIVE MATERIAL IN AIR IN RESTRICTED AREAS (1)No licensee shall possess, use, or transfer radioactive material in such a manner as to permit any individual in a restricted area to inhale a quantity of radioactive material in any period of 1 calendar quarter greater than the quantity which would result from inhalation for  $40\ \text{hours}$  per week for  $13\ \text{weeks}$  at uniform concentrations of radioactive material in air specified in Appendix A, Table I, Column 1 of this subchapter. radioactive material is of such form that intake by absorption through the skin is likely, individual exposures to radioactive material shall be controlled so that the uptake of radioactive material by any organ from either inhalation or absorption or both routes of intake in any calendar quarter does not exceed that which would result from inhaling such radioactive material for 40 hours per week for 13 weeks at uniform concentrations specified in Appendix A, Table I, Column 1 of this subchapter.
- (a) Since the concentration specified for tritium oxide vapor assumes equal intakes by skin absorption and inhalation, the total intake permitted is twice that which would result from inhalation alone at the concentration specified for H-3(S) in Appendix A, Table I, Column 1 of this subchapter for 40 hours per week for 13 weeks.
- (b) For radon-222, the limiting quantity is that inhaled in a period of 1 calendar year. For radioactive material designated "Sub" in the "Isotope" column of Appendix A, Table I of this subchapter, the concentration value specified is based upon exposure to the material as an external radiation source. Individual exposures to these materials may be accounted for as part of the limitation on individual dose in ARM 37.14.705. These nuclides shall be subject to the precautionary procedures required by (4)(a) of this rule.
- (c) Multiply the concentration values specified in Appendix A, Table I, Column 1 of this subchapter by  $6.3 \times 10^8$  ml to obtain the quarterly quantity limit. Multiply the concentration value specified in Appendix A, Table I, Column 1 of this subchapter by  $2.5 \times 10^9$  ml to obtain the annual quantity limit for Rn-222.

- Significant intake by ingestion or injection is (d) presumed to occur only as a result of circumstances such as accident, inadvertence, poor procedure, or similar special conditions. Such intakes must be evaluated and accounted for by techniques and procedures as may be appropriate circumstances of the occurrence. Exposures so evaluated shall be included in determining whether the limitation on individual exposures in (1) has been exceeded.
- Regulatory guidance on assessment of intakes of radioactive material is given in Regulatory Guide 8.9, "Acceptable Concepts, Models, Equations and Assumptions for a Bioassay Program." Single copies of Regulatory Guide 8.9 are available from the Office of Standards Development, US Nuclear Regulatory Commission, Washington, DC 20555, upon written request.
- No licensee shall possess, use, or transfer mixtures of U-234, U-235, and U-238 in soluble form in such a manner as to permit any individual in a restricted area to inhale a quantity of such material in excess of the intake limits specified in Appendix A, Table I, Column 1 of this subchapter. If such soluble uranium is of a form such that absorption through the skin is likely, individual exposures to such material shall be controlled so that the uptake of such material by any organ from either inhalation or absorption or both routes of intake does not exceed that which would result from inhaling such material at the limits specified in Appendix A, Table I, Column 1 of this subchapter and (1)(c) of this rule.
- For purposes of determining compliance with the requirements of this rule, the licensee shall use suitable measurements of concentrations of radioactive materials in air detecting and evaluating airborne radioactivity restricted areas and in addition, as appropriate, shall use measurements of radioactivity in the body, measurements of radioactivity excreted from the body, or any combination of such measurements as may be necessary for timely detection and assessment of individual intakes of radioactivity by exposed It is assumed that an individual individuals. radioactive material at the airborne concentration in which he is present unless he uses respiratory protective equipment. assessment of a particular individual's intake of radioactive material is necessary, intakes less than those which would result from inhalation for 2 hours in any 1 day or for 10 hours in any 1 week at uniform concentrations specified in Appendix A, Table I, Column 1 of this subchapter need not be included in such assessment, provided that for any assessment in excess of these amounts the entire amount is included.

- (4) The licensee shall, as a precautionary procedure, use process or other engineering controls, to the extent practicable, to limit concentrations of radioactive materials in air to levels below those which delimit an airborne radioactivity area. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.708 PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS: EXPOSURE OF MINORS (1) For determining the doses specified in this rule, a dose from X or gamma rays up to 10 MeV may be assumed to be equivalent to the exposure measured by a properly calibrated appropriate instrument in air at or near the body surface in the region of the highest dose rate.
- (2) No licensee or registrant shall possess, use, or transfer sources of radiation in such a manner as to cause any individual within a restricted area, who is under 18 years of age, to receive in any period of 1 calendar quarter from all sources of radiation in such licensee's or registrant's possession a dose in excess of 10% of the limits specified in the table in ARM 37.14.705(2).
- (3) No licensee shall possess, use, or transfer radioactive material in such a manner as to cause any individual within a restricted area, who is under 18 years of age, to be exposed to airborne radioactive material in an average concentration in excess of the limits specified in Appendix A, Table II, of this subchapter. For purposes of this section, concentrations may be averaged over periods not greater than a week.
- (4) The provisions of ARM 37.14.707(4)(b) and (5) shall apply to exposures subject to (3) of this rule except that the references in ARM 37.14.707(4)(b) and (5) to Appendix A, Table I, Column 1 of this subchapter shall be deemed to be references to Appendix A, Table II, Column 1 of this subchapter. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.709 PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS: EXTERNAL SOURCES IN UNRESTRICTED AREAS (1) It is the intent of this rule to limit radiation levels so that it is unlikely that individuals in unrestricted areas would receive a dose to the whole body in excess of 0.5 rem in any 1 year. If, in specific instances, it is determined by the department that this intent is not met, the department may, pursuant to ARM 37.14.116, impose such additional requirements on the licensee or registrant as may be necessary to meet the intent.
- (2) Except as authorized by the department pursuant to (3) of this rule, no licensee or registrant shall possess, use, or transfer sources of radiation in such a manner as to create in any unrestricted area from such sources of radiation in his possession:
- (a) radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 2 millirems in any 1 hour; or
- (b) radiation levels which, if an individual were continuously present in the area could result in his receiving a dose in excess of 100 millirems in any 7 consecutive days.
- (3) Any person may apply to the department for proposed limits upon levels of radiation in unrestricted areas in excess of those specified in (2) of this rule resulting from the applicant's possession or use of sources of radiation. Such applications should include information as to anticipated average radiation levels and anticipated occupancy times for each unrestricted area involved. The department will approve the proposed limits if the applicant demonstrates to the satisfaction of the department that the proposed limits are not likely to cause any individual to receive a dose to the whole body in any period of 1 calendar year in excess of 0.5 rem. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.710 PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS: RADIOACTIVITY IN EFFLUENTS TO UNRESTRICTED AREAS (1) A licensee shall not possess, use, or transfer licensed material so as to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in Appendix A, Table II of this subchapter except as authorized pursuant to ARM 37.14.741 or (2) of this rule. For purposes of this rule, concentrations may be averaged over a period not greater than 1 year.
- (2) An application for a license or amendment may include proposed limits higher than those specified in (1) of this rule. The department will approve the proposed limits if the applicant demonstrates:
- (a) that the applicant has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas; and
- (b) that it is not likely that radioactive material discharged in the effluent would result in the exposure of an individual to concentrations of radioactive material in air or water exceeding the limits specified in Appendix A, Table II of this subchapter.
- (3) An application for higher limits pursuant to (2) of this rule shall include information demonstrating that the applicant has made a reasonable effort to minimize the radioactivity discharged in effluents to unrestricted areas, and shall include, as pertinent:
- (a) information as to flow rates, total volume of effluent, peak concentration of each radionuclide in the effluent, and concentration of each radionuclide in the effluent averaged over a period of 1 year at the point where the effluent leaves a stack, tube, pipe, or similar conduit;
- (b) a description of the properties of the effluents, including:
  - (i) chemical composition,
- (ii) physical characteristics, including suspended solids content in liquid effluents, and nature of gas or aerosol for air effluents,
- (iii) the hydrogen ion concentrations (pH) of liquid effluents, and
- (iv) the size range of particulates in effluents released
  into air;

- (c) a description of the anticipated human occupancy in the unrestricted area where the highest concentration of radioactive material from the effluent is expected, and, in the case of a river or stream, a description of water uses downstream from the point of release of the effluent;
- (d) information as to the highest concentration of each radionuclide in an unrestricted area, including anticipated concentrations averaged over a period of 1 year:
  - (i) in air at any point of human occupancy, or
- (ii) in water at points of use downstream from the point of release of the effluent;
- (e) the background concentration of radionuclides in the receiving river or stream prior to the release of liquid effluent;
- (f) a description of the environmental monitoring equipment, including sensitivity of the system, and procedures and calculations to determine concentrations of radionuclides in the unrestricted area and possible reconcentrations of radionuclides; and
- (g) a description of the waste treatment facilities and procedures used to reduce the concentration of radionuclides in effluents prior to their release.
- (4) For the purposes of this rule, the concentration limits in Appendix A, Table II of this subchapter shall apply at the boundary of the restricted area. The concentration of radioactive material discharged through a stack, pipe or similar conduit may be determined with respect to the point where the material leaves the conduit. If the conduit discharges within the restricted area, the concentration at the boundary may be determined by applying appropriate factors for dilution, dispersion, or decay between the point of discharge and the boundary.
- (5) In addition to limiting concentrations in effluent streams, the department may limit quantities of radioactive material released in air or water during a specified period of time if it appears that the daily intake of radioactive material from air, water, or food by a suitable sample of an exposed population group, averaged over a period not exceeding 1 year, would otherwise exceed the daily intake resulting from continuous exposure to air or water containing one-third the concentration of radioactive material specified in Appendix A, Table II of this subchapter.
- (6) The provisions of this rule do not apply to disposal of radioactive material into sanitary sewerage systems, which is governed by ARM 37.14.742. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

37.14.711 PERMISSIBLE DOSES, LEVELS, AND CONCENTRATIONS: ORDERS REQUIRING FURNISHING OF BIOASSAY SERVICES (1) Where necessary or desirable in order to aid in determining the extent of an individual's exposure to concentrations of radioactive material, the department may incorporate license provisions or issue an order requiring a licensee or registrant to make available to the individual appropriate bioassay services and to furnish a copy of the reports of such services to the department. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

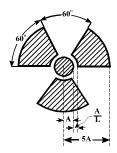
Rules 12 through 19 reserved

- 37.14.720 PRECAUTIONARY PROCEDURES: SURVEYS (1) licensee or registrant shall make or cause to be made such surveys as may be necessary for him to establish compliance with this subchapter. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
  - 37.14.721 PRECAUTIONARY PROCEDURES: PERSONNEL MONITORING
- (1) Each licensee or registrant shall supply appropriate personnel monitoring equipment to, and shall require the use of such equipment by:
- Each individual who enters a restricted area under (a) such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 25% of the applicable value specified in ARM 37.14.705(2).
- Each individual under 18 years of age who enters a restricted area under such circumstances that he receives, or is likely to receive, a dose in any calendar quarter in excess of 5% of the applicable value specified in ARM 37.14.705(2).
  - Each individual who enters a high radiation area.
- (d) Licensees or registrants who use personnel dosimeters to satisfy a requirement of this subchapter shall utilize personnel dosimetry services approved by the department. (History: Sec. 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-201, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 22 through 24 reserved

- 37.14.725 PRECAUTIONARY PROCEDURES: CAUTION SIGNS, LABELS, AND SIGNALS (1) Except as otherwise authorized by the department, symbols prescribed by this rule shall use the conventional radiation caution colors: magenta or purple on yellow background.
- The symbol prescribed by this rule is the conventional 3-blade design:

Cross-hatch area is to be magenta or purple. Background is to be yellow. To put this symbol in perspective, "A" represents the radius of the center circle.



- (b) In addition to the contents of signs and labels prescribed in this rule, a licensee or registrant may provide on or near such signs and labels any additional information which may be appropriate in aiding individuals to minimize exposure to radiation.
- (2) Each radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: "CAUTION--RADIATION AREA" or "DANGER--RADIATION AREA".
- (3) High radiation areas shall be distinguished as follows:
- (a) Each high radiation area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: "CAUTION--HIGH RADIATION AREA" or "DANGER--HIGH RADIATION AREA".
- (b) Each entrance or access point to a high radiation area shall be:
- equipped with a control device which shall cause the (i) level of radiation to be reduced below that at which an individual might receive a dose of 100 millirems in 1 hour upon entry into the area; or

- (ii) equipped with a control device which shall energize a conspicuous visible or audible alarm signal in such a manner that the individual entering the high radiation area and the licensee or a supervisor of the activity are made aware of the entry; or
- (iii) maintained locked except during periods when access to the area is required, with positive control over each individual entry.
- (c) The controls required by (b) above shall be established in such a way that no individual will be prevented from leaving a high radiation area.
- (d) In the case of a high radiation area established for a period of 30 days or less, direct surveillance to prevent unauthorized entry may be substituted for the controls required by (b) above.
- (e) Any licensee or registrant may apply to the department for approval of methods not included in (b) and (d) above for controlling access to high radiation areas. The department will approve the proposed alternatives if the licensee or registrant demonstrates that the alternative methods of control will prevent unauthorized entry into a high radiation area, and that the requirement of (c) above is met.
- (4) Each airborne radioactivity area shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: "CAUTION--AIRBORNE RADIOACTIVITY AREA".
- (5) Additional requirements for radioactivity areas are that:
- (a) Each area or room in which any radioactive material, other than natural uranium or thorium, is used or stored in an amount exceeding 10 times the quantity of radioactive material specified in Appendix B of this subchapter shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: "CAUTION--RADIOACTIVE MATERIAL" or "DANGER--RADIOACTIVE MATERIAL".
- (b) Each area or room in which natural uranium or thorium is used or stored in an amount exceeding 100 times the quantity specified in Appendix B of this subchapter shall be conspicuously posted with a sign or signs bearing the radiation caution symbol and the words: "CAUTION--RADIOACTIVE MATERIAL" or "DANGER--RADIOACTIVE MATERIAL".

- (6) Containers of radioactive material shall meet the following requirements:
- (a) Except as provided in (c) below, each container of radioactive material shall bear a durable, clearly visible label identifying the radioactive contents.
- (b) A label required pursuant to (a) above shall bear the radiation caution symbol and the words: "CAUTION--RADIOACTIVE MATERIAL" or "DANGER--RADIOACTIVE MATERIAL".
- (i) It shall also provide sufficient information to permit individuals handling or using the containers, or working in the vicinity thereof, to take precautions to avoid or minimize exposures. This information, as appropriate, will include radiation levels, kinds of material, estimate of activity, date for which activity is estimated, etc.
- (c) Notwithstanding the provisions of (a) above, labeling is not required:
- (i) for containers that do not contain radioactive material in quantities greater than the applicable quantities listed in Appendix B of this subchapter;
- (ii) for containers containing only natural uranium or thorium in quantities no greater than 10 times the applicable quantities listed in Appendix B of this subchapter;
- (iii) for containers that do not contain radioactive material in concentrations greater than the applicable concentrations listed in Appendix A, Table I, Column 2 of this subchapter;
- (iv) for containers when they are attended by an individual who takes the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established by this subchapter;
- (v) for containers when they are in transport and packaged and labeled in accordance with regulations published by the US department of transportation;
- (vi) for containers which are accessible only to individuals authorized to handle or use them (for example, containers in locations such as water-filled canals, storage vaults, or hot cells) or to work in the vicinity thereof, provided that the contents are identified to such individuals by a readily available written record; and
- (vii) for manufacturing and process equipment such as piping and tanks.
- (7) All radiation machines shall be labeled in a manner which cautions individuals that radiation is produced when the machine is being operated. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.726 PRECAUTIONARY PROCEDURES: EXCEPTIONS FROM POSTING AND LABELING REQUIREMENTS (1) Notwithstanding the provisions of ARM 37.14.725:
- (a) A room or area is not required to be posted with a caution sign because of the presence of a sealed source, provided the radiation level 12 inches from the surface of the source container or housing does not exceed 5 millirems per hour.
- (b) Rooms or other areas in hospitals are not required to be posted with caution signs, and control of entrance or access thereto pursuant to ARM 37.14.725 is not required, because of the presence of patients containing radioactive material provided that there are personnel in attendance who will take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in this subchapter.
- (c) Caution signs are not required to be posted in areas or rooms containing radioactive material for periods of less than 8 hours provided that:
- (i) the material is constantly attended during such periods by an individual who shall take the precautions necessary to prevent the exposure of any individual to radiation or radioactive material in excess of the limits established in this subchapter, and
- (ii) such area or room is subject to the licensee's or registrant's control.
- (d) A room or other area is not required to be posted with a caution sign, and control is not required for each entrance or access point to a room or other area which is a high radiation area solely because of the presence of radioactive material prepared for transport and packaged and labeled in accordance with regulations of the US department of transportation. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 27 and 28 reserved

- 37.14.729 PRECAUTIONARY PROCEDURES: INSTRUCTION OF PERSONNEL (1) Instructions required for individuals working in or frequenting any portion of a restricted area are specified in ARM 37.14.1706. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.730 PRECAUTIONARY PROCEDURES: STORAGE AND CONTROL OF SOURCES OF RADIATION (1) Sources of radiation shall be secured against unauthorized removal from the place of storage.
- (2) Sources of radiation in an unrestricted area and not in storage shall be tended under the constant surveillance and immediate control of the licensee or registrant. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.731 PRECAUTIONARY PROCEDURES: PROCEDURES FOR PICKING UP, RECEIVING, AND OPENING PACKAGES (1) Each licensee or registrant who expects to receive a package containing quantities of radioactive material in excess of the Type A quantities specified in the table following (4) of this rule shall:
- (a) if the package is to be delivered to the licensee's or registrant's facility by the carrier, make arrangements to receive the package when it is offered for delivery by the carrier; or
- (b) if the package is to be picked up by the licensee or registrant at the carrier's terminal, make arrangements to receive notification from the carrier of the arrival of the package, at the time of arrival.
- (2) Each licensee or registrant who picks up a package of radioactive material from a carrier's terminal shall pick up the package expeditiously upon receipt of notification from the carrier of its arrival.
- (3) Each licensee or registrant, upon receipt of a package of radioactive material, shall monitor the external surfaces of the package for radioactive contamination caused by leakage of the radioactive contents. The monitoring shall be performed as soon as practicable after receipt, but no later than 3 hours after the package is received at the licensee's facility if received during the licensee's normal working hours or 18 hours if received after normal working hours. Such monitoring need not be performed on:
- (a) packages containing no more than the exempt quantity specified in the table following (4) of this rule;
- (b) packages containing no more than 10 millicuries of radioactive material consisting solely of tritium, carbon-14, sulfur-35 or iodine-125;

- (c) packages containing only radioactive material as gases or in special form;
- (d) packages containing only radioactive material in other than liquid form (including Mo-99/Tc-99m generators) and not exceeding the Type A quantity limit specified in the table following (4) of this rule; and
- (e) packages containing only radionuclides with half-lives of less than 30 days and a total quantity of no more than 100 millicuries.
- (4)If removable radioactive contamination in excess of 0.01 microcurie (22,200 disintegrations per minute) per 100 square centimeters of package surface is found on the external surface of the package, the licensee or registrant shall immediately notify, by telephone and telegraph, the final delivering carrier and the department.

Transport Group	Exempt Quantity Limit (in millicuries)	Type A Quantity Limit (in curies)
I II III IV V VI VII Special form	0.01 0.1 1 1 1 25,000	0.001 0.050 3 20 20 1,000 1,000

(5) Each licensee or registrant, upon receipt of a package containing quantities of radioactive material in excess of the Type A quantities specified in the table following (4) of this rule, other than those transported by exclusive use vehicle, shall monitor the radiation levels external to the package.

- (a) The package shall be monitored as soon as practicable after receipt, but no later than 3 hours after the package is received at the licensee's facility if received during the licensee's normal working hours, or 18 hours if received after normal working hours.
- (b) If radiation levels are found on the external surface of the package in excess of 200 millirems per hour, or in excess of 10 millirems per hour at 3 feet from the external surface of the package, the licensee or registrant shall immediately notify, by telephone and telegraph, the final delivering carrier and the department.
- (6) Each licensee or registrant shall establish and maintain procedures for safely opening packages in which radioactive material is received, and shall assure that such procedures are followed and that due consideration is given to special instructions for the type of package being opened. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 32 through 39 reserved

- 37.14.740 WASTE DISPOSAL: GENERAL REQUIREMENT (1) No licensee shall dispose of any radioactive material except:
- (a) by transfer to an authorized recipient as provided in ARM 37.14.547, or
- (b) as authorized pursuant to ARM 37.14.710, 37.14.741, 37.14.742 or 37.14.743. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-301, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.741 WASTE DISPOSAL: METHOD OF OBTAINING APPROVAL OF PROPOSED DISPOSAL PROCEDURES (1) Any person may apply to the department for approval of proposed procedures to dispose of radioactive material in a manner not otherwise authorized in this subchapter. Each application shall include a description of the radioactive material, including the quantities and kinds of radioactive material and levels of radioactivity involved, and the proposed manner and conditions of disposal. application, where appropriate, should also include an analysis and evaluation of pertinent information as to the nature of the environment, including topographical, qeological, meteorological, and hydrological characteristics; usage of ground and surface waters in the general area; the nature and other potentially affected facilities; of procedures to be observed to minimize the risk of unexpected or hazardous exposures.
- (2) The department will not approve any application for a license to receive radioactive material from other persons for disposal on land not owned by the state or the federal government. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-301, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.742 WASTE DISPOSAL: DISPOSAL BY RELEASE INTO SANITARY SEWERAGE SYSTEMS (1) No licensee shall discharge radioactive material into a sanitary sewerage system unless:
  - (a) it is readily soluble or dispersible in water; and
- (b) the quantity of any radioactive material released into the system by the licensee in any 1 day does not exceed the larger of:
- (i) the quantity which, if diluted by the average daily quantity of sewage released into the sewer by the licensee, will result in an average concentration equal to the limits specified in Appendix A, Table I, Column 2, of this subchapter, or
- (ii) ten times the quantity of such material specified in Appendix B of this subchapter; and

- (c) the quantity of any radioactive material released in any 1 month, if diluted by the average monthly quantity of water released by the licensee, will not result in an average concentration exceeding the limits specified in Appendix A, Table I, Column 2, of this subchapter; and
- (d) the gross quantity of radioactive material released into the sewerage system by the licensee does not exceed 1 curie per year.
- (2) Excreta from individuals undergoing medical diagnosis or therapy with radioactive material shall be exempt from any limitations contained in this rule. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-301, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

#### 37.14.743 WASTE DISPOSAL: DISPOSAL BY BURIAL IN SOIL

- (1) No licensee shall dispose of radioactive material by burial in soil unless:
- (a) the total quantity of radioactive material buried at any 1 location and time does not exceed, at the time of burial, 1,000 times the amount specified in Appendix B of this subchapter;
  - (b) burial is at a minimum of 4 feet; and
- (c) successive burials are separated by distances of at least 6 feet and not more than 12 burials are made in any year. (History: Sec. 75-3-201, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-201, 75-3-301, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)

#### 37.14.744 WASTE DISPOSAL: DISPOSAL BY INCINERATION

(1) No licensee shall incinerate radioactive material for the purpose of disposal or preparation for disposal except as specifically approved by the department pursuant to ARM 37.14.710 and 37.14.741. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-301, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 45 through 49 reserved

- 37.14.750 RECORDS, REPORTS AND NOTIFICATION: SURVEYS, RADIATION MONITORING, DISPOSAL (1) Each licensee or registrant shall maintain records showing the radiation exposures of all individuals for whom personnel monitoring is required under ARM 37.14.721. Such records shall be kept on department form MRH-31, in accordance with the instructions contained in that form, or on clear and legible records containing all the information required by department form MRH-31. The doses entered on the forms or records shall be for periods of time not exceeding 1 calendar quarter.
- (2) Each licensee or registrant shall maintain records in the same units used in this subchapter, showing the results of surveys required by ARM 37.14.720, monitoring required by ARM 37.14.731(3), (4), and (5), and disposals made under ARM 37.14.741, 37.14.742, and 37.14.743.
- (3) Records required by this subchapter shall be maintained for the following periods:
- (a) Records of individual exposure to radiation and to radioactive material which must be maintained pursuant to the provisions of (1) of this rule and records of bioassays, including results of whole body counting examinations, made pursuant to ARM 37.14.711 shall be preserved until the department authorizes disposition.
- (b) Records of the results of surveys and monitoring which must be maintained pursuant to (2) of this rule shall be preserved for 2 years after completion of the survey except that the following records shall be maintained until the department authorizes their disposition:
- (i) Records of the results of surveys to determine compliance with ARM 37.14.707(1).
- (ii) In the absence of personnel monitoring data, records of the results of surveys to determine external radiation dose.
- (iii) Records of the results of surveys used to evaluate the release of radioactive effluents to the environment.
- (c) Records of disposal of licensed material made pursuant to ARM 37.14.741, 37.14.742 and 37.14.743 shall be maintained until the department authorizes their disposition.

- (d) Records which must be maintained pursuant to this subchapter may be the original or a reproduced copy or microform if such reproduced copy or microform is duly authenticated by authorized personnel and the microform is capable of producing a clear and legible copy after storage for the period specified by department rules.
- (e) If there is a conflict pertaining to the retention period for the same type of record, the retention period specified in this subchapter for such records shall apply unless the department, pursuant to ARM 37.14.106(1) has granted a specific exemption from the record retention requirements specified in this subchapter.
- (4) The discontinuance of or curtailment of activities, does not relieve the licensee or registrant of responsibility for retaining all records required by this rule. A licensee or registrant may, however, request the department to accept such records. The acceptance of the records by the department relieves the licensee or registrant of subsequent responsibility only in respect to their preservation as required by this rule. (History: Sec. 75-3-204, MCA; IMP, Sec. 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.751 RECORDS, REPORTS, AND NOTIFICATION: REPORTS OF THEFT OR LOSS OF SOURCES OF RADIATION (1) Each licensee or registrant shall report by telephone and telegraph to the department the theft or loss of any source of radiation immediately after such occurrence becomes known. (History: Sec. 75-3-204, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 52 through 54 reserved

- 37.14.755 RECORDS, REPORTS, AND NOTIFICATION:
  NOTIFICATION OF INCIDENTS (1) Each licensee or registrant shall immediately notify the department by telephone and telegraph of any incident involving any source of radiation possessed by him and which may have caused or threatens to cause:
- (a) a dose to the whole body of any individual of 25 rems or more of radiation; a dose to the skin of the whole body of any individual of 150 rems or more of radiation; or a dose to the feet, ankles, hands, or forearms of any individual of 375 rems or more of radiation; or
- (b) the release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 5,000 times the limits specified for such materials in Appendix A, Table II of this subchapter; or
- (c) a loss of 1 working week or more of the operation of any facilities affected; or
  - (d) damage to property in excess of \$200,000.
- (2) Each licensee or registrant shall within 24 hours notify the department by telephone and telegraph of any incident involving any source of radiation possessed by him and which may have caused or threatens to cause:
- (a) a dose to the whole body of any individual of 5 rems or more of radiation; a dose to the skin of the whole body of any individual of 30 rems or more of radiation; or a dose to the feet, ankles, hands, or forearms of 75 rems or more of radiation; or
- (b) the release of radioactive material in concentrations which, if averaged over a period of 24 hours, would exceed 500 times the limits specified for such materials in Appendix A, Table II of this subchapter; or
- (c) a loss of 1 day or more of the operation of any facilities affected; or
  - (d) damage to property in excess of \$2,000.
- (3) Any report filed with the department pursuant to this rule shall be prepared in such a manner that names of individuals who have received excessive doses will be stated in a separate part of the report. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.756 RECORDS, REPORTS, AND NOTIFICATION: REPORTS OF OVEREXPOSURES AND EXCESSIVE LEVELS AND CONCENTRATIONS (1) addition to any notification required by ARM 37.14.755, each licensee or registrant shall make a report in writing within 30 days to the department of:
- each exposure of an individual to radiation in excess of the applicable limits in ARM 37.14.705 or 37.14.708(2) or the license;
- (b) each exposure of an individual to radioactive material in excess of the applicable limits in ARM 37.14.707(1), (2) or 37.14.708(3), or the license;
- levels of radiation or concentrations of radioactive material in a restricted area in excess of any other applicable limit in the license;
- (d) any incident for which notification is required by ARM 37.14.755; and
- levels of radiation or concentrations of radioactive (e) material, whether or not involving excessive exposure of any individual, in an unrestricted area in excess of 10 times any applicable limit set forth in this subchapter or in the license.
- Each report required under (1) of this rule shall describe the extent of exposure of individuals to radiation or radioactive material, including estimates individual's exposure as required by (3) of this rule; levels of radiation and concentrations of radioactive material involved; the cause of the exposure, levels or concentrations; and corrective steps taken or planned to assure against recurrence.
- Any report filed with the department pursuant to this rule shall include for each individual exposed the name, social security number, and date of birth, and an estimate of the The report shall be prepared so that this individual's dose. information is stated in a separate part of the report. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.757 RECORDS, REPORTS, AND NOTIFICATION: VACATING PREMISES (1) Each specific licensee shall, no less than 30 days before vacating or relinquishing possession or control of premises which may have been contaminated with radioactive material as a result of his activities, notify the department in writing of intent to vacate. When deemed necessary by the department, the licensee shall decontaminate the premises in such a manner as the department may specify. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.758 RECORDS, REPORTS, AND NOTIFICATION: NOTIFICATIONS AND REPORTS TO INDIVIDUALS (1) Requirements for notification and reports to individuals of exposure to radiation or radioactive material are specified in ARM 37.14.1707.
- (2) When a licensee or registrant is required pursuant to ARM 37.14.756 to report to the department any exposure of an individual to radiation or radioactive material, the licensee or registrant shall also notify the individual. Such notice shall be transmitted at a time not later than the transmittal to the department, and shall comply with the provisions of ARM 37.14.1707(1). (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

APPENDIX A CONCENTRATIONS IN AIR AND WATER ABOVE NATURAL BACKGROUND

			Table I		Table II	
Element (atomic number)	Isotope	<u>1</u>	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Actinium (89)	Ac-227	S	2x10 <sup>-12</sup>	6x10 <sup>-5</sup>	8x10 <sup>-14</sup>	2x10 <sup>-6</sup>
110021120 (0)		Ĩ	$3x10^{-11}$	$9x10^{-3}$	$9x10^{-13}$	$3x10^{-4}$
	Ac-228	S	$9x10^{-8}$	$3x10^{-3}$	$3x10^{-9}$	$9x10^{-5}$
		I	$2x10^{-8}$	$3x10^{-3}$	6x10 <sup>-10</sup>	$9x10^{-5}$
Americium (95)	Am-241	S	6x10 <sup>-12</sup>	$1x10^{-4}$	$2x10^{-13}$	4x10 <sup>-6</sup>
		I	$1x10^{-10}$	$8x10^{-4}$	$4x10^{-12}$	$3x10^{-5}$
	Am-242n	n S	$6x10^{-12}$	$1x10^{-4}$	$2x10^{-13}$	$4x10^{-6}$
		I	$3x10^{-10}$	$3x10^{-3}$	$9x10^{-12}$	$9x10^{-5}$
	Am-242	S	$4x10^{-8}$	$4x10^{-3}$	$1x10^{-9}$	$1x10^{-4}$
		I	$5x10^{-8}$	$4x10^{-3}$	$2x10^{-9}$	$1x10^{-4}$
	Am-243	S	$6x10^{-12}$	$1x10^{-4}$	$2x10^{-13}$	$4x10^{-6}$
		I	$1x10^{-10}$	$8x10^{-4}$	$4x10^{-12}$	$3x10^{-5}$
	Am-244	S	$4x10^{-6}$	$1x10^{-1}$	$1x10^{-7}$	$5x10^{-3}$
		I	$2x10^{-5}$	$1x10^{-1}$	$8x10^{-7}$	$5x10^{-3}$
Antimony (51)	Sb-122	S	$2x10^{-7}$	$8x10^{-4}$	6x10 <sup>-9</sup>	$3x10^{-5}$
		I	$1x10^{-7}$	$8x10^{-4}$	$5x10^{-9}$	$3x10^{-5}$
	Sb-124	S	$2x10^{-7}$	$7x10^{-4}$	$5x10^{-9}$	$2x10^{-5}$
		I	$2x10^{-8}$	$7x10^{-4}$	$7x10^{-10}$	2x1
	Sb-125	S	$5x10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1 \times 10^{-4}$
		I	$3x10^{-8}$	$3x10^{-3}$	$9x10^{-10}$	$1x10^{-4}$
Argon (18)	Ar-37	Sub <sup>2</sup>	$6x10^{-3}$		$1x10^{-4}$	
	Ar-41	Sub	$2x10^{-6}$		$4x10^{-8}$	
Arsenic (33)	As-73	S	$2x10^{-6}$	$1x10^{-2}$	$7x10^{-8}$	$5x10^{-4}$
		I	$4x10^{-7}$	$1x10^{-2}$	$1x10^{-8}$	$5x10^{-4}$
	As-74	S	$3x10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$5x10^{-5}$
		I	$1x10^{-7}$	$2x10^{-3}$	$4x10^{-9}$	$5x10^{-5}$
	As-76	S	$1x10^{-7}$	$6x10^{-4}$	$4x10^{-9}$	$2x10^{-5}$
		I	$1x10^{-7}$	$6x10^{-4}$	$3x10^{-9}$	$2x10^{-5}$
	As-77	S	$5x10^{-7}$	$2x10^{-3}$	$2x10^{-8}$	$8x10^{-5}$
		I	$4 \times 10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$8x10^{-5}$

			Table I		Table II	
Element	Isotope	1	Column 1	Column 2		Column 2
(atomic			Air	Water	Air	Water
number)			(μCi/ml)	(µCi/ml)	(µCi/ml)	(µCi/ml)
Astatine (85)	At-211	S	$7x10^{-9}$	5x10 <sup>-5</sup>	$2x10^{-10}$	2x10 <sup>-6</sup>
		I	$3x10^{-8}$	$2x10^{-3}$	$1x10^{-9}$	$7x10^{-5}$
Barium (56)	Ba-131	S	$1x10^{-6}$	$5x10^{-3}$	$4x10^{-8}$	$2x10^{-4}$
		I	$4x10^{-7}$	$5x10^{-3}$	$1 \times 10^{-8}$	$2 \times 10^{-4}$
	Ba-140	S	$1x10^{-7}$	$8 \times 10^{-4}$	$4x10^{-9}$	$3x10^{-5}$
		Ι	$4x10^{-8}$	$7x10^{-4}$	$1x10^{-9}$	$2x10^{-5}$
Berkelium (97)	Bk-249	S	$9x10^{-10}$	$2x10^{-2}$	$3x10^{-11}$	$6x10^{-4}$
		I	$1 \times 10^{-7}$	$2x10^{-2}$	$4 \times 10^{-9}$	$6 \times 10^{-4}$
	Bk-250	S	$1 \times 10^{-7}$	$6x10^{-3}$	$5x10^{-9}$	$2 \times 10^{-4}$
		Ι	$1x10^{-6}$	$6x10^{-3}$	$4x10^{-8}$	$2x10^{-4}$
Beryllium (4)	Be-7	S	$6x10^{-6}$	$5x10^{-2}$	$2x10^{-7}$	$2x10^{-3}$
Dery III am (I)	DC /	I	$1x10^{-6}$	$5x10^{-2}$	$4x10^{-8}$	$2x10^{-3}$
Bismuth (83)	Bi-206	S	2x10 <sup>-7</sup>	$1x10^{-3}$	6x10 <sup>-9</sup>	$4x10^{-5}$
, ,		I	$1 \times 10^{-7}$	$1x10^{-3}$	$5x10^{-9}$	$4x10^{-5}$
	Bi-207	S	$2x10^{-7}$	$2x10^{-3}$	$6x10^{-9}$	$6x10^{-5}$
		I	$1x10^{-8}$	$2x10^{-3}$	$5x10^{-10}$	$6x10^{-5}$
	Bi-210	S	$6x10^{-9}$	$1x10^{-3}$	$2x10^{-10}$	$4x10^{-5}$
		I	$6x10^{-9}$	$1x10^{-3}$	$2x10^{-10}$	$4x10^{-5}$
	Bi-212	S	$1x10^{-7}$	$1x10^{-2}$	$3x10^{-9}$	$4x10^{-4}$
		I	$2x10^{-7}$	$1x10^{-2}$	$7x10^{-9}$	$4x10^{-4}$
Bromine (35)	Br-82	S	$1x10^{-6}$	$8x10^{-3}$	$4x10^{-8}$	$3x10^{-4}$
		I	$2x10^{-7}$	$1x10^{-3}$	$6x10^{-9}$	$4x10^{-5}$
Cadmium (48)	Cd-109	S	$5x10^{-8}$	$5x10^{-3}$	$2x10^{-9}$	$2x10^{-4}$
		I	$7x10^{-8}$	$5x10^{-3}$	$3x10^{-9}$	$2x10^{-4}$
	Cd-115m	S	$4x10^{-8}$	$7x10^{-4}$	$1x10^{-9}$	$3x10^{-5}$
		I	$4x10^{-8}$	$7x10^{-4}$	$1x10^{-9}$	$3x10^{-5}$
	Cd-115	S	$2x10^{-7}$	$1x10^{-3}$	$8x10^{-9}$	$3x10^{-5}$
		I	$2x10^{-7}$	$1x10^{-3}$	$6x10^{-9}$	$4x10^{-5}$
Calcium (20)	Ca-45	S	$3x10^{-8}$	$3x10^{-4}$	$1x10^{-9}$	9x10 <sup>-6</sup>
		I	$1x10^{-7}$	$5x10^{-3}$	$4x10^{-9}$	$2x10^{-4}$
	Ca-47	S	$2x10^{-7}$	$1x10^{-3}$	$6x10^{-9}$	$5x10^{-5}$
		I	$2x10^{-7}$	$1x10^{-3}$	$6x10^{-9}$	$3x10^{-5}$

			Table I		Table II	
Element (atomic	Isotope		Column 1 Air	Column 2 Water	Column 1	Column 2 Water
number)			(µCi/ml)	(μCi/ml)	(µCi/ml)	(µCi/ml)
Californium(98)	) Cf-249	S	2x10 <sup>-12</sup>	$1 \times 10^{-4}$	5x10 <sup>-14</sup>	4x10 <sup>-6</sup>
carrorniam(50)	, CI 219	I	$1 \times 10^{-10}$	$7x10^{-4}$	$3x10^{-12}$	$2x10^{-5}$
	Cf-250	S	$5x10^{-12}$	$4x10^{-4}$	$2x10^{-13}$	$1 \times 10^{-5}$
	01 200	I	$1 \times 10^{-10}$	$7x10^{-4}$	$3x10^{-12}$	$3x10^{-5}$
	Cf-251	S	$2x10^{-12}$	$1x10^{-4}$	$6x10^{-14}$	$4x10^{-6}$
	01 201	I	$1x10^{-10}$	$8x10^{-4}$	$3x10^{-12}$	$3x10^{-5}$
	Cf-252	S	$6x10^{-12}$	$2x10^{-4}$	$2x10^{-13}$	$7x10^{-6}$
	01 101	Ĭ	$3x10^{-11}$	$2x10^{-4}$	$1x10^{-12}$	$7x10^{-6}$
	Cf-253	S	$8x10^{-10}$	$4x10^{-3}$	$3x10^{-11}$	$1 \times 10^{-4}$
		I	$8x10^{-10}$	$4x10^{-3}$	$3x10^{-11}$	$1 \times 10^{-4}$
	Cf-254	S	$5x10^{-12}$	$4x10^{-6}$	$2x10^{-13}$	$1x10^{-7}$
		I	$5x10^{-12}$	$4x10^{-6}$	$2x10^{-13}$	$1 \times 10^{-7}$
Carbon (6)	C-14	S	4x10 <sup>-6</sup>	$2x10^{-2}$	$1x10^{-7}$	$8x10^{-4}$
	(CO <sub>2</sub> ) Si	ıb²	$5x10^{-5}$		$1x10^{-6}$	
Cerium (58)	Ce-141	S	$4x10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$9x10^{-5}$
		I	$2x10^{-7}$	$3x10^{-3}$	$5x10^{-9}$	$9x10^{-5}$
	Ce-143	S	$3x10^{-7}$	$1x10^{-3}$	$9x10^{-9}$	$4x10^{-5}$
		I	$2x10^{-7}$	$1x10^{-3}$	$7x10^{-9}$	$4x10^{-5}$
	Ce-144	S	$1x10^{-8}$	$3x10^{-4}$	$3x10^{-10}$	$1x10^{-5}$
		I	$6 \times 10^{-9}$	$3x10^{-4}$	$2x10^{-10}$	$1x10^{-5}$
Cesium (55)	Cs-131	S	$1x10^{-5}$	$7x10^{-2}$	$4x10^{-7}$	$2x10^{-3}$
		I	$3x10^{-6}$	$3x10^{-2}$	$1x10^{-7}$	$9x10^{-4}$
	Cs-134m	S	$4x10^{-5}$	$2x10^{-1}$	$1x10^{-6}$	$6x10^{-3}$
		I	$6 \times 10^{-6}$	$3x10^{-2}$	$2x10^{-7}$	$1 \times 10^{-3}$
	Cs-134	S	$4x10^{-8}$	$3x10^{-4}$	$1x10^{-9}$	$9x10^{-6}$
		I	$1 \times 10^{-8}$	$1x10^{-3}$	$4x10^{-10}$	$4x10^{-5}$
	Cs-135	S	$5 \times 10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1 \times 10^{-4}$
		I	$9x10^{-8}$	$7x10^{-3}$	$3x10^{-9}$	$2x10^{-4}$
	Cs-136	S	$4 \times 10^{-7}$	$2x10^{-3}$	$1 \times 10^{-8}$	$9x10^{-5}$
		Ι	$2x10^{-7}$	$2x10^{-3}$	$6 \times 10^{-9}$	$6x10^{-5}$
	Cs-137	S	$6 \times 10^{-8}$	$4 \times 10^{-4}$	$2x10^{-9}$	$2x10^{-5}$
		Ι	$1x10^{-8}$	$1x10^{-3}$	$5x10^{-10}$	$4x10^{-5}$
Chlorine (17)	Cl-36	S	$4x10^{-7}$	$2x10^{-3}$	$1 \times 10^{-8}$	$8x10^{-5}$
	_	Ι	$2x10^{-8}$	$2x10^{-3}$	$8 \times 10^{-10}$	$6x10^{-5}$
	Cl-38	S	$3x10^{-6}$	$1 \times 10^{-2}$	$9x10^{-8}$	$4x10^{-4}$
		Ι	$2x10^{-6}$	$1x10^{-2}$	$7x10^{-8}$	$4x10^{-4}$

			Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Chromium (24)	Cr-51	S I	1x10 <sup>-5</sup> 2x10 <sup>-6</sup>	5x10 <sup>-2</sup> 5x10 <sup>-2</sup>	4x10 <sup>-7</sup> 8x10 <sup>-8</sup>	2x10 <sup>-3</sup> 2x10 <sup>-3</sup>
Cobalt (27)	Co-57 Co-58m Co-58 Co-60	S I S I S I S	$3 \times 10^{-6}$ $2 \times 10^{-7}$ $2 \times 10^{-5}$ $9 \times 10^{-6}$ $8 \times 10^{-7}$ $5 \times 10^{-8}$ $3 \times 10^{-7}$	$2 \times 10^{-2}$ $1 \times 10^{-2}$ $8 \times 10^{-2}$ $6 \times 10^{-2}$ $4 \times 10^{-3}$ $3 \times 10^{-3}$ $1 \times 10^{-3}$	$1 \times 10^{-7}$ $6 \times 10^{-9}$ $6 \times 10^{-7}$ $3 \times 10^{-7}$ $3 \times 10^{-8}$ $2 \times 10^{-9}$ $1 \times 10^{-8}$	$5 \times 10^{-4}$ $4 \times 10^{-4}$ $3 \times 10^{-3}$ $2 \times 10^{-3}$ $1 \times 10^{-4}$ $9 \times 10^{-5}$ $5 \times 10^{-5}$
Copper (29)	Cu-64	S I S I	$9 \times 10^{-9}$ $2 \times 10^{-6}$ $1 \times 10^{-6}$	$1 \times 10^{-3}$ $1 \times 10^{-2}$ $6 \times 10^{-3}$	$   \begin{array}{c}     1 \times 10^{-8} \\     3 \times 10^{-10}   \end{array} $ $   \begin{array}{c}     7 \times 10^{-8} \\     4 \times 10^{-8}   \end{array} $	$3x10^{-5}$ $3x10^{-4}$ $2x10^{-4}$
Curium (96)	Cm-242 Cm-243 Cm-244 Cm-245 Cm-246 Cm-247 Cm-248 Cm-249	S I S I S I S I S I S I	$\begin{array}{c} 1 \times 10^{-10} \\ 2 \times 10^{-10} \\ 6 \times 10^{-12} \\ 1 \times 10^{-10} \\ 9 \times 10^{-12} \\ 1 \times 10^{-10} \\ 5 \times 10^{-12} \\ 1 \times 10^{-10} \\ 5 \times 10^{-12} \\ 1 \times 10^{-10} \\ 5 \times 10^{-12} \\ 1 \times 10^{-10} \\ 6 \times 10^{-13} \\ 1 \times 10^{-5} \\ 1 \times 10^{-5} \\ 1 \times 10^{-5} \end{array}$	$7 \times 10^{-4}$ $7 \times 10^{-4}$ $1 \times 10^{-4}$ $1 \times 10^{-4}$ $2 \times 10^{-4}$ $8 \times 10^{-4}$ $1 \times 10^{-4}$ $8 \times 10^{-4}$ $1 \times 10^{-4}$ $8 \times 10^{-4}$ $1 \times 10^{-5}$ $4 \times 10^{-5}$ $6 \times 10^{-2}$ $6 \times 10^{-2}$	$4 \times 10^{-12}$ $6 \times 10^{-12}$ $2 \times 10^{-13}$ $3 \times 10^{-12}$ $3 \times 10^{-12}$ $3 \times 10^{-13}$ $4 \times 10^{-12}$ $2 \times 10^{-14}$ $4 \times 10^{-13}$ $4 \times 10^{-7}$	2x10 <sup>-5</sup> 2x10 <sup>-5</sup> 5x10 <sup>-6</sup> 2x10 <sup>-5</sup> 7x10 <sup>-6</sup> 3x10 <sup>-5</sup> 4x10 <sup>-6</sup> 3x10 <sup>-5</sup> 4x10 <sup>-6</sup> 2x10 <sup>-5</sup> 4x10 <sup>-6</sup> 2x10 <sup>-7</sup> 1x10 <sup>-6</sup> 2x10 <sup>-3</sup>
Dysprosium (66	Dy-165	S I S I	$3x10^{-6}$ $2x10^{-6}$ $2x10^{-7}$ $2x10^{-7}$	$1 \times 10^{-2} \\ 1 \times 10^{-2} \\ 1 \times 10^{-3} \\ 1 \times 10^{-3}$	$9 \times 10^{-8}$ $7 \times 10^{-8}$ $8 \times 10^{-9}$ $7 \times 10^{-9}$	$4 \times 10^{-4}$ $4 \times 10^{-4}$ $4 \times 10^{-5}$ $4 \times 10^{-5}$

			Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Einsteinium(99	)Es-253	S	8x10 <sup>-10</sup>	7x10 <sup>-4</sup>	3x10 <sup>-11</sup>	2x10 <sup>-5</sup>
	Es-254m	I S	$6 \times 10^{-10}$ $5 \times 10^{-9}$	$7x10^{-4}$ $5x10^{-4}$	$2x10^{-11}$ $2x10^{-10}$	$2x10^{-5}$ $2x10^{-5}$
	Es-254	I S I	$6 \times 10^{-9}$ $2 \times 10^{-11}$ $1 \times 10^{-10}$	$5x10^{-4}$ $4x10^{-4}$ $4x10^{-4}$	$2x10^{-10}$ $6x10^{-13}$ $4x10^{-12}$	$2x10^{-5}$ $1x10^{-5}$ $1x10^{-5}$
	Es-255	S	$5 \times 10^{-10}$ $4 \times 10^{-10}$	8x10 <sup>-4</sup> 8x10 <sup>-4</sup>	2x10 <sup>-11</sup> 1x10 <sup>-11</sup>	$3x10^{-5}$ $3x10^{-5}$
Erbium (68)	Er-169	S	6x10 <sup>-7</sup>	$3x10^{-3}$	2x10 <sup>-8</sup>	9x10 <sup>-5</sup>
	Er-171	I S	$4 \times 10^{-7}$ $7 \times 10^{-7}$	$3x10^{-3}$ $3x10^{-3}$	1x10 <sup>-8</sup> 2x10 <sup>-8</sup>	$9x10^{-5}$ $1x10^{-4}$
Europium (63)	Fu-152	I S	$6 \times 10^{-7}$ $4 \times 10^{-7}$	$3x10^{-3}$ $2x10^{-3}$	2x10 <sup>-8</sup> 1x10 <sup>-8</sup>	$1 \times 10^{-4}$ $6 \times 10^{-5}$
	=9.2 hrs) Eu-152	I S	$3x10^{-7}$ $1x10^{-8}$	$2x10^{-3}$ $2x10^{-3}$	$1 \times 10^{-8}$ $4 \times 10^{-10}$	$6x10^{-5}$ $8x10^{-5}$
( T	r=13 yrs) Eu-154	I S	$2x10^{-8}$ $4x10^{-9}$	$2x10^{-3}$ $6x10^{-4}$	$6x10^{-10}$ $1x10^{-10}$	$8 \times 10^{-5}$ $2 \times 10^{-5}$
	Eu-155	I S I	$7x10^{-9}$ $9x10^{-8}$ $7x10^{-8}$	$6x10^{-4}$ $6x10^{-3}$ $6x10^{-3}$	$2x10^{-10}$ $3x10^{-9}$ $3x10^{-9}$	$2x10^{-5}$ $2x10^{-4}$ $2x10^{-4}$
Fermium (100)	Fm-254	S	$6 \times 10^{-8}$	$4x10^{-3}$	$2x10^{-9}$	$1 \times 10^{-4}$
	Fm-255	I S	$7 \times 10^{-8}$ $2 \times 10^{-8}$	$4x10^{-3}$ $1x10^{-3}$	$2x10^{-9}$ $6x10^{-10}$	$1 \times 10^{-4}$ $3 \times 10^{-5}$
	Fm-256	I S I	$1 \times 10^{-8}$ $3 \times 10^{-9}$ $2 \times 10^{-9}$	$1x10^{-3}$ $3x10^{-5}$ $3x10^{-5}$	$4 \times 10^{-10}$ $1 \times 10^{-10}$ $6 \times 10^{-11}$	$3x10^{-5}$ $9x10^{-7}$ $9x10^{-7}$
Fluorine (9)	F-18	S	5x10 <sup>-6</sup>	2x10 <sup>-2</sup>	2x10 <sup>-7</sup>	8x10 <sup>-4</sup>
, ,		I	$3x10^{-6}$	$1x10^{-2}$	9x10 <sup>-8</sup>	5x10 <sup>-4</sup>
Gadolinium (64		S I	$2x10^{-7}$ $9x10^{-8}$	$6x10^{-3}$ $6x10^{-3}$	$8x10^{-9}$ $3x10^{-9}$	$2x10^{-4}$ $2x10^{-4}$
	Gd-159	S I	$5x10^{-7}$ $4x10^{-7}$	$2x10^{-3}$ $2x10^{-3}$	$2x10^{-8}$ $1x10^{-8}$	$8 \times 10^{-5}$ $8 \times 10^{-5}$

<sup>(</sup>See notes at end of appendix)

		_	Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Gallium (31)	Ga-72	S I	$2x10^{-7}$ $2x10^{-7}$	1x10 <sup>-3</sup> 1x10 <sup>-3</sup>	8x10 <sup>-9</sup> 6x10 <sup>-9</sup>	$4x10^{-5}$ $4x10^{-5}$
Germanium (32)	Ge-71	S I	$1 \times 10^{-5}$ $6 \times 10^{-6}$	5x10 <sup>-2</sup> 5x10 <sup>-2</sup>	$4x10^{-7}$ $2x10^{-7}$	$2x10^{-3}$ $2x10^{-3}$
Gold (79)	Au-196 Au-198 Au-199	S I S I S	$1 \times 10^{-6}$ $6 \times 10^{-7}$ $3 \times 10^{-7}$ $2 \times 10^{-7}$ $1 \times 10^{-6}$ $8 \times 10^{-7}$	$5 \times 10^{-3}$ $4 \times 10^{-3}$ $2 \times 1^{-3}$ $1 \times 10^{-3}$ $5 \times 10^{-3}$ $4 \times 10^{-3}$	4x10 <sup>-8</sup> 2x10 <sup>-8</sup> 1x10 <sup>-8</sup> 8x10 <sup>-9</sup> 4x10 <sup>-8</sup> 3x10 <sup>-8</sup>	$2 \times 10^{-4}$ $1 \times 10^{-4}$ $5 \times 10^{-5}$ $5 \times 10^{-5}$ $2 \times 10^{-4}$ $2 \times 10^{-4}$
Hafnium (72)	Hf-181	S I	4x10 <sup>-8</sup> 7x10 <sup>-8</sup>	2x10 <sup>-3</sup> 2x10 <sup>-3</sup>	1x10 <sup>-9</sup> 3x10 <sup>-9</sup>	7x10 <sup>-5</sup> 7x10 <sup>-5</sup>
Holmium (67)	Но-166	S I	$2x10^{-7}$ $2x10^{-7}$	9x10 <sup>-4</sup> 9x10 <sup>-4</sup>	7x10 <sup>-9</sup> 6x10 <sup>-9</sup>	$3x10^{-5}$ $3x10^{-5}$
Hydrogen (1)	H-3	S I ıb²	$5 \times 10^{-6}$ $5 \times 10^{-6}$ $2 \times 10^{-3}$	1x10 <sup>-1</sup> 1x10 <sup>-1</sup>	$2x10^{-7}$ $2x10^{-7}$ $4x10^{-5}$	3x10 <sup>-3</sup> 3x10 <sup>-3</sup>
Indium (49)	In-113m In-114m In-115m In-115	SISISI	$8 \times 10^{-6}$ $7 \times 10^{-6}$ $1 \times 10^{-7}$ $2 \times 10^{-8}$ $2 \times 10^{-6}$ $2 \times 10^{-6}$ $2 \times 10^{-7}$ $3 \times 10^{-8}$	$4 \times 10^{-2}$ $4 \times 10^{-2}$ $5 \times 10^{-4}$ $5 \times 10^{-4}$ $1 \times 10^{-2}$ $1 \times 10^{-2}$ $3 \times 10^{-3}$ $3 \times 10^{-3}$	$3x10^{-7}$ $2x10^{-7}$ $4x10^{-9}$ $7x10^{-10}$ $8x10^{-8}$ $6x10^{-8}$ $9x10^{-9}$ $1x10^{-9}$	$1 \times 10^{-3}$ $1 \times 10^{-3}$ $2 \times 10^{-5}$ $2 \times 10^{-5}$ $4 \times 10^{-4}$ $4 \times 10^{-5}$ $9 \times 10^{-5}$

<sup>(</sup>See notes at end of appendix)

			Table I		Table II	
Element (atomic number)	Isotope	: <sup>1</sup>	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Iodine (53)	I-125	S	5x10 <sup>-9</sup>	4x10 <sup>-5</sup>	8x10 <sup>-11</sup>	2x10 <sup>-7</sup>
(,		Ī	$2x10^{-7}$	$6x10^{-3}$	$6x10^{-9}$	$2x10^{-4}$
	I-126	S	$8x10^{-9}$	$5x10^{-5}$	$9x10^{-11}$	$3x10^{-7}$
		I	$3x10^{-7}$	$3x10^{-3}$	$1x10^{-8}$	$9x10^{-5}$
	I-129	S	$2x10^{-9}$	$1x10^{-5}$	$2x10^{-11}$	$6x10^{-8}$
		I	$7x10^{-8}$	$6x10^{-3}$	$2x10^{-9}$	$2x10^{-4}$
	I-131	S	$9x10^{-9}$	$6 \times 10^{-5}$	$1 \times 10^{-10}$	$3x10^{-7}$
		I	$3x10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$6x10^{-5}$
	I-132	S	$2x10^{-7}$	$2x10^{-3}$	$3x10^{-9}$	$8x10^{-6}$
		I	$9x10^{-7}$	$5x10^{-3}$	$3x10^{-8}$	$2x10^{-4}$
	I-133	S	$3x10^{-8}$	$2x10^{-4}$	$4x10^{-10}$	$1x10^{-6}$
		I	$2x10^{-7}$	$1x10^{-3}$	$7 \times 10^{-9}$	$4x10^{-5}$
	I-134	S	$5x10^{-7}$	$4x10^{-3}$	$6 \times 10^{-9}$	$2x10^{-5}$
		I	$3x10^{-6}$	$2x10^{-2}$	$1 \times 10^{-7}$	$6x10^{-4}$
	I-135	S	$1 \times 10^{-7}$	$7 \times 10^{-4}$	$1 \times 10^{-9}$	$4x10^{-6}$
		I	$4x10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$7x10^{-5}$
Iridium (77)	Ir-190	S	$1x10^{-6}$	$6x10^{-3}$	$4x10^{-8}$	$2x10^{-4}$
		I	$4 \times 10^{-7}$	$5x10^{-3}$	$1x10^{-8}$	$2x10^{-4}$
	Ir-192	S	$1x10^{-7}$	$1x10^{-3}$	$4x10^{-9}$	$4x10^{-5}$
		I	$3x10^{-8}$	$1x10^{-3}$	$9x10^{-10}$	$4x10^{-5}$
	Ir-194	S	$2x10^{-7}$	$1x10^{-3}$	$8 \times 10^{-9}$	$3x10^{-5}$
		I	$2x10^{-7}$	$9 \times 10^{-4}$	$5x10^{-9}$	$3x10^{-5}$
Iron (26)	Fe-55	S	$9x10^{-7}$	$2x10^{-2}$	3x10 <sup>-8</sup>	$8x10^{-4}$
11011 (20)	10 33	I	$1 \times 10^{-6}$	$7x10^{-2}$	$3x10^{-8}$	$2x10^{-3}$
	Fe-59	S	$1 \times 10^{-7}$	$2x10^{-3}$	$5x10^{-9}$	$6x10^{-5}$
	16 37	I		$2x10^{-3}$	$2x10^{-9}$	$5x10^{-5}$
Vrimton (26)	Kr-87m	Cub	63210-6		$1x10^{-7}$	
Krypton (36)	Kr-85	Sub	$1 \times 10^{-5}$		$3 \times 10^{-7}$	
	Kr-87	Sub	$1x10^{-6}$		$2x10^{-8}$	
	Kr-88	Sub	$1 \times 10^{-6}$		$2x10^{-8}$	
T	T - 140	~	010-7	710-4	F10-9	010-5
Lanthanum (57)	⊥а-140		$2x10^{-7}$	$7 \times 10^{-4}$	$5x10^{-9}$	$2x10^{-5}$
		I	$1x10^{-7}$	$7x10^{-4}$	$4x10^{-9}$	$2x10^{-5}$

		_	Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column : Water (µCi/ml)
Lead (82)	Pb-203	S	3x10 <sup>-6</sup>	1x10 <sup>-2</sup>	9x10 <sup>-8</sup>	4x10 <sup>-4</sup>
		I	$2x10^{-6}$	$1x10^{-2}$	$6x10^{-8}$	$4x10^{-4}$
	Pb-210	S	$1 \times 10^{-10}$	$4x10^{-6}$	$4x10^{-12}$	$1 \times 10^{-7}$
		Ι	$2x10^{-10}$	$5x10^{-3}$	$8 \times 10^{-12}$	$2x10^{-4}$
	Pb-212	S I	$2x10^{-8}$ $2x10^{-8}$	$6 \times 10^{-4}$ $5 \times 10^{-4}$	$6 \times 10^{-10}$ $7 \times 10^{-10}$	$2x10^{-5}$ $2x10^{-5}$
Lutetium (71)	Lu-177	S	6x10 <sup>-7</sup>	$3x10^{-3}$	$2x10^{-8}$	1x10 <sup>-4</sup>
		Ι	$5x10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1x10^{-4}$
Manganese (25)	Mn-52	S	$2x10^{-7}$	$1x10^{-3}$	$7x10^{-9}$	$3x10^{-5}$
		I	$1x10^{-7}$	$9x10^{-4}$	$5x10^{-9}$	$3x10^{-5}$
	Mn-54	S	$4x10^{-7}$	$4x10^{-3}$	$1 \times 10^{-8}$	$1x10^{-4}$
		I	$4 \times 10^{-8}$	$3x10^{-3}$	$1 \times 10^{-9}$	$1 \times 10^{-4}$
	Mn-56	S I	8x10 <sup>-7</sup> 5x10 <sup>-7</sup>	$4x10^{-3}$ $3x10^{-3}$	$3x10^{-8}$ $2x10^{-8}$	$1 x 10^{-4} \ 1 x 10^{-4}$
Mercury (80)	Hg-197m	S	$7x10^{-7}$	$6x10^{-3}$	$3x10^{-8}$	2x10 <sup>-4</sup>
ricically (00)	119 10/11	I	$8x10^{-7}$	$5x10^{-3}$	$3x10^{-8}$	$2x10^{-4}$
	Hg-197	S	$1x10^{-6}$	$9x10^{-3}$	$4x10^{-8}$	$3x10^{-4}$
	J	I	$3x10^{-6}$	$1x10^{-2}$	$9x10^{-8}$	$5x10^{-4}$
	Hg-203	S	$7x10^{-8}$	$5x10^{-4}$	$2x10^{-9}$	$2x10^{-5}$
		Ι	$1x10^{-7}$	$3x10^{-3}$	$4x10^{-9}$	$1x10^{-4}$
Molybdenum (42	)Mo-99	S	$7x10^{-7}$	$5x10^{-3}$	$3x10^{-8}$	$2x10^{-4}$
		Ι	$2x10^{-7}$	$1x10^{-3}$	$7x10^{-9}$	$4x10^{-5}$
Neodymium (60)	Nd-144	S	$8x10^{-11}$	$2x10^{-3}$	$3x10^{-12}$	$7x10^{-5}$
		I	$3x10^{-10}$	$2x10^{-3}$	$1x10^{-11}$	$8x10^{-5}$
	Nd-147	S	$4x10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$6x10^{-5}$
		Ι	$2x10^{-7}$	$2x10^{-3}$	$8 \times 10^{-9}$	$6x10^{-5}$
	Nd-149	S	$2x10^{-6}$	$8 \times 10^{-3}$	$6 \times 10^{-8}$	$3 \times 10^{-4}$
		Ι	$1x10^{-6}$	$8x10^{-3}$	$5x10^{-8}$	$3x10^{-4}$
Neptunium (93)	Np-237	S	$4x10^{-12}$	$9x10^{-5}$	$1x10^{-13}$	$3x10^{-6}$
		I	$1 \times 10^{-10}$	$9x10^{-4}$	$4 \times 10^{-12}$	$3x10^{-5}$
	Np-239	S	$8 \times 10^{-7}$	$4x10^{-3}$	$3x10^{-8}$	$1 \times 10^{-4}$
		Ι	$7x10^{-7}$	$4x10^{-3}$	$2x10^{-8}$	$1x10^{-4}$

			Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Nickel (28)	Ni-59	S I	5x10 <sup>-7</sup> 8x10 <sup>-7</sup>	6x10 <sup>-3</sup> 6x10 <sup>-2</sup>	2x10 <sup>-8</sup> 3x10 <sup>-8</sup>	2x10 <sup>-4</sup> 2x10 <sup>-3</sup>
	Ni-63	S	$6x10^{-8}$ $3x10^{-7}$	$8 \times 10^{-4}$ $2 \times 10^{-2}$	$2x10^{-9}$ $1x10^{-8}$	$3x10^{-5}$ $7x10^{-4}$
	Ni-65	S I	9x10 <sup>-7</sup> 5x10 <sup>-7</sup>	$4 \times 10^{-3}$ $3 \times 10^{-3}$	3x10 <sup>-8</sup> 2x10 <sup>-8</sup>	$1 \times 10^{-4}$ $1 \times 10^{-4}$
Niobium (41)	Nb-93m	S I	$1 \times 10^{-7}$ $2 \times 10^{-7}$	1x10 <sup>-2</sup> 1x10 <sup>-2</sup>	4x10 <sup>-9</sup> 5x10 <sup>-9</sup>	$4 \times 10^{-4}$ $4 \times 10^{-4}$
	Nb-95	S	$5 \times 10^{-7}$ $1 \times 10^{-7}$	$3x10^{-3}$ $3x10^{-3}$	2x10 <sup>-8</sup> 3x10 <sup>-9</sup>	$1 \times 10^{-4}$ $1 \times 10^{-4}$
	Nb-97	S I	6x10 <sup>-6</sup> 5x10 <sup>-6</sup>	$3x10^{-2}$ $3x10^{-2}$	$2x10^{-7}$ $2x10^{-7}$	$9 \times 10^{-4}$ $9 \times 10^{-4}$
Osmium (76)	Os-185	S I	5x10 <sup>-7</sup> 5x10 <sup>-8</sup>	$2x10^{-3}$ $2x10^{-3}$	2x10 <sup>-8</sup> 2x10 <sup>-9</sup>	$7x10^{-5}$ $7x10^{-5}$
	Os-191m	S	$2x10^{-5}$ $9x10^{-6}$	$7x10^{-2}$ $7x10^{-2}$	6x10 <sup>-7</sup> 3x10 <sup>-7</sup>	$3x10^{-3}$ $2x10^{-3}$
	Os-191	S I	$1 \times 10^{-6}$ $4 \times 10^{-7}$	$5x10^{-3}$ $5x10^{-3}$	$4x10^{-8}$ $1x10^{-8}$	$2x10^{-4}$ $2x10^{-4}$
	Os-193	S I	$4x10^{-7}$ $3x10^{-7}$	$2x10^{-3}$ $2x10^{-3}$	$1 \times 10^{-8}$ $9 \times 10^{-9}$	$6 \times 10^{-5}$ $5 \times 10^{-5}$
Palladium (46)	Pd-103	S I	$1 \times 10^{-6}$ $7 \times 10^{-7}$	$1 \times 10^{-2}$ $8 \times 10^{-3}$	5x10 <sup>-8</sup> 3x10 <sup>-8</sup>	$3x10^{-4}$ $3x10^{-4}$
	Pd-109	S I	$6 \times 10^{-7}$ $4 \times 10^{-7}$	$3x10^{-3}$ $2x10^{-3}$	2x10 <sup>-8</sup> 1x10 <sup>-8</sup>	$9x10^{-5}$ $7x10^{-5}$
Phosphorus (15	)P-32	S I	$7x10^{-8}$ $8x10^{-8}$	$5x10^{-4}$ $7x10^{-4}$	2x10 <sup>-9</sup> 3x10 <sup>-9</sup>	2x10 <sup>-5</sup> 2x10 <sup>-5</sup>

			Table I		Table II	
Element (atomic number)	Isotope		Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column : Water (µCi/ml)
Platinum (78)	Pt-191	S	8x10 <sup>-7</sup>	4x10 <sup>-3</sup>	3x10 <sup>-8</sup>	1x10 <sup>-4</sup>
11001110111 (70)	10 171	I	$6x10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1x10^{-4}$
	Pt-193m	S	$7x10^{-6}$	$3x10^{-2}$	$2x10^{-7}$	$1x10^{-3}$
		I	$5x10^{-6}$	$3x10^{-2}$	$2x10^{-7}$	$1x10^{-3}$
	Pt-193	S	$1x10^{-6}$	$3x10^{-2}$	$4x10^{-8}$	$9x10^{-4}$
		I	$3x10^{-7}$	$5x10^{-2}$	$1x10^{-8}$	$2x10^{-3}$
	Pt-197m	S	$6x10^{-6}$	$3x10^{-2}$	$2x10^{-7}$	$1x10^{-3}$
		I	$5x10^{-6}$	$3x10^{-2}$	$2x10^{-7}$	$9x10^{-4}$
	Pt-197	S	$8x10^{-7}$	$4x10^{-3}$	$3x10^{-8}$	$1 \times 10^{-4}$
		I	$6x10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1 \times 10^{-4}$
Plutonium (94)	Pu-238	S	$2x10^{-12}$	$1x10^{-4}$	$7x10^{-14}$	5x10 <sup>-6</sup>
		I	$3x10^{-11}$	$8x10^{-4}$	$1x10^{-12}$	$3x10^{-5}$
	Pu-239	S	$2x10^{-12}$	$1 \times 10^{-4}$	$6 \times 10^{-14}$	$5x10^{-6}$
		I	$4x10^{-11}$	$8x10^{-4}$	$1x10^{-12}$	$3x10^{-5}$
	Pu-240	S	$2x10^{-12}$	$1 \times 10^{-4}$	$6x10^{-14}$	$5x10^{-6}$
		I	$4x10^{-11}$	$8x10^{-4}$	$1x10^{-12}$	$3x10^{-5}$
	Pu-241	S	$9x10^{-11}$	$7x10^{-3}$	$3x10^{-12}$	$2x10^{-4}$
		I	$4x10^{-8}$	$4x10^{-2}$	$1 \times 10^{-9}$	$1x10^{-3}$
	Pu-242	S	$2x10^{-12}$	$1 \times 10^{-4}$	$6 \times 10^{-14}$	$5x10^{-6}$
		I	$4x10^{-11}$	$9x10^{-4}$	$1 \times 10^{-12}$	$3x10^{-5}$
	Pu-243	S	$2x10^{-6}$	$1x10^{-2}$	$6 \times 10^{-8}$	$3 \times 10^{-4}$
		I	$2x10^{-6}$	$1x10^{-2}$	$8 \times 10^{-8}$	$3x10^{-4}$
	Pu-244	S	$2x10^{-12}$	$1 \times 10^{-4}$	$6x10^{-14}$	$4x10^{-6}$
		Ι	$3x10^{-11}$	$3x10^{-4}$	$1x10^{-12}$	$1x10^{-5}$
Polonium (84)	Po-210	S	$5x10^{-10}$	$2x10^{-5}$	$2x10^{-11}$	$7x10^{-7}$
,		I	$2x10^{-10}$	$8x10^{-4}$	$7x10^{-12}$	$3x10^{-5}$
Potassium (19)	K-42	S	2x10 <sup>-6</sup>	$9x10^{-3}$	$7x10^{-8}$	3x10 <sup>-4</sup>
	<del>-</del>	I	$1x10^{-7}$	$6x10^{-4}$	$4x10^{-9}$	$2x10^{-5}$
Praseodymium(5	9) Pr-142	S	$2x10^{-7}$	$9x10^{-4}$	$7x10^{-9}$	3x10 <sup>-5</sup>
	, - <b></b>	I	$2x10^{-7}$	$9x10^{-4}$	$5x10^{-9}$	$3x10^{-5}$
	Pr-143	S	$3x10^{-7}$	$1x10^{-3}$	$1x10^{-8}$	$5x10^{-5}$
		I	$2x10^{-7}$	$1x10^{-3}$	$6x10^{-9}$	$5x10^{-5}$

			Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Promethium (61	.)Pm-147	S	6x10 <sup>-8</sup>	6x10 <sup>-3</sup>	2x10 <sup>-9</sup>	2x10 <sup>-4</sup>
	Pm-149	I S I	$1 \times 10^{-7}$ $3 \times 10^{-7}$ $2 \times 10^{-7}$	$6x10^{-3}$ $1x10^{-3}$ $1x10^{-3}$	3x10 <sup>-9</sup> 1x10 <sup>-8</sup> 8x10 <sup>-9</sup>	$2x10^{-4}$ $4x10^{-5}$ $4x10^{-5}$
Protactinium(9	01)Pa-230	S I	$2x10^{-9}$ $8x10^{-10}$	$7x10^{-3}$ $7x10^{-3}$	6x10 <sup>-11</sup> 3x10 <sup>-11</sup>	$2x10^{-4}$ $2x10^{-4}$
	Pa-231	S I	$1 \times 10^{-12}$ $1 \times 10^{-10}$	$3x10^{-5}$ $8x10^{-4}$	$4x10^{-14}$ $4x10^{-12}$	$9x10^{-7}$ $2x10^{-5}$
	Pa-233	S I	$6 \times 10^{-7}$ $2 \times 10^{-7}$	$4x10^{-3}$ $3x10^{-3}$	$2x10^{-8}$ $6x10^{-9}$	$1 \times 10^{-4}$ $1 \times 10^{-4}$
Radium (88)	Ra-223	S I	2x10 <sup>-9</sup> 2x10 <sup>-10</sup>	$2x10^{-5}$ $1x10^{-4}$	$6 \times 10^{-11}$ $8 \times 10^{-12}$	$7x10^{-7}$ $4x10^{-6}$
	Ra-224	S I	$5x10^{-9}$ $7x10^{-10}$	$7x10^{-5}$ $2x10^{-4}$	$2x10^{-10}$ $2x10^{-11}$	$2x10^{-6}$ $5x10^{-6}$
	Ra-226	S I	$3x10^{-11}$ $5x10^{-11}$	$4x10^{-7}$ $9x10^{-4}$	$3x10^{-12}$ $2x10^{-12}$	$3x10^{-8}$ $3x10^{-5}$
	Ra-228	S I	$7x10^{-11}$ $4x10^{-11}$	$8 \times 10^{-7}$ $7 \times 10^{-4}$	$2x10^{-12}$ $1x10^{-12}$	$3x10^{-8}$ $3x10^{-5}$
Radon (86)	Rn-220 Rn-222 <sup>3</sup>	S S	$3x10^{-7}$ $3x10^{-8}$		1x10 <sup>-8</sup> 3x10 <sup>-9</sup>	
Rhenium (75)	Re-183	S I	$3x10^{-6}$ $2x10^{-7}$	$2x10^{-2}$ $8x10^{-3}$	9x10 <sup>-8</sup> 5x10 <sup>-9</sup>	$6x10^{-4}$ $3x10^{-4}$
	Re-186	S I	$6x10^{-7}$ $2x10^{-7}$	$3x10^{-3}$ $1x10^{-3}$	2x10 <sup>-8</sup> 8x10 <sup>-9</sup>	9x10 <sup>-5</sup> 5x10 <sup>-5</sup>
	Re-187	S I	$9x10^{-6}$ $5x10^{-7}$	$7x10^{-2}$ $4x10^{-2}$	$3x10^{-7}$ $2x10^{-8}$	$3x10^{-3}$ $2x10^{-3}$
	Re-188	S I	$4x10^{-7}$ $2x10^{-7}$	$2x10^{-3}$ $9x10^{-4}$	$1 \times 10^{-8}$ $6 \times 10^{-9}$	$6x10^{-5}$ $3x10^{-5}$
Rhodium (45)	Rh-103m	S I	$8x10^{-5}$ $6x10^{-5}$	$4 \times 10^{-1}$ $3 \times 10^{-1}$	3x10 <sup>-6</sup> 2x10 <sup>-6</sup>	$1 \times 10^{-2}$ $1 \times 10^{-2}$
	Rh-105	S I	$8 \times 10^{-7}$ $5 \times 10^{-7}$	$4x10^{-3}$ $3x10^{-3}$	$3x10^{-8}$ $2x10^{-8}$	$1 \times 10^{-4}$ $1 \times 10^{-4}$

			Table I		Table II	
Element (atomic number)	Isotope		Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column : Water (µCi/ml)
Rubidium (37)	Rb-86 Rb-87	S I S I	3x10 <sup>-7</sup> 7x10 <sup>-8</sup> 5x10 <sup>-7</sup> 7x10 <sup>-8</sup>	$2 \times 10^{-3}$ $7 \times 10^{-4}$ $3 \times 10^{-3}$ $5 \times 10^{-3}$	$1 \times 10^{-8}$ $2 \times 10^{-9}$ $2 \times 10^{-8}$ $2 \times 10^{-9}$	$7x10^{-5}$ $2x10^{-5}$ $1x10^{-4}$ $2x10^{-4}$
Ruthenium (44)	Ru-97 Ru-103 Ru-105 Ru-106	S I S I S I S I	$2 \times 10^{-6}$ $2 \times 10^{-6}$ $5 \times 10^{-7}$ $8 \times 10^{-8}$ $7 \times 10^{-7}$ $5 \times 10^{-7}$ $8 \times 10^{-8}$ $6 \times 10^{-9}$	$1 \times 10^{-2}$ $1 \times 10^{-2}$ $2 \times 10^{-3}$ $2 \times 10^{-3}$ $3 \times 10^{-3}$ $4 \times 10^{-4}$ $3 \times 10^{-4}$	$8 \times 10^{-8}$ $6 \times 10^{-8}$ $2 \times 10^{-8}$ $3 \times 10^{-9}$ $2 \times 10^{-8}$ $3 \times 10^{-9}$ $2 \times 10^{-10}$	$4 \times 10^{-4}$ $3 \times 10^{-4}$ $8 \times 10^{-5}$ $8 \times 10^{-5}$ $1 \times 10^{-4}$ $1 \times 10^{-5}$ $1 \times 10^{-5}$
Samarium (62)	Sm-147 Sm-151 Sm-153	S I S I S I	$7 \times 10^{-11}$ $3 \times 10^{-10}$ $6 \times 10^{-8}$ $1 \times 10^{-7}$ $5 \times 10^{-7}$ $4 \times 10^{-7}$	$2x10^{-3}$ $2x10^{-3}$ $1x10^{-2}$ $1x10^{-2}$ $2x10^{-3}$ $2x10^{-3}$	$2 \times 10^{-12}$ $9 \times 10^{-12}$ $2 \times 10^{-9}$ $5 \times 10^{-9}$ $2 \times 10^{-8}$ $1 \times 10^{-8}$	$6 \times 10^{-5}$ $7 \times 10^{-5}$ $4 \times 10^{-4}$ $4 \times 10^{-4}$ $8 \times 10^{-5}$ $8 \times 10^{-5}$
Scandium (21)	Sc-46 Sc-47 Sc-48	S I S I S I	2x10 <sup>-7</sup> 2x10 <sup>-8</sup> 6x10 <sup>-7</sup> 5x10 <sup>-7</sup> 2x10 <sup>-7</sup> 1x10 <sup>-7</sup>	$1 \times 10^{-3}$ $1 \times 10^{-3}$ $3 \times 10^{-3}$ $3 \times 10^{-3}$ $8 \times 10^{-4}$	$8 \times 10^{-9}$ $8 \times 10^{-10}$ $2 \times 10^{-8}$ $2 \times 10^{-8}$ $6 \times 10^{-9}$ $5 \times 10^{-9}$	$4 \times 10^{-5}$ $4 \times 10^{-5}$ $9 \times 10^{-5}$ $9 \times 10^{-5}$ $3 \times 10^{-5}$ $3 \times 10^{-5}$
Selenium (34)	Se-75	S I	$1 \times 10^{-6}$ $1 \times 10^{-7}$	$9x10^{-3}$ $8x10^{-3}$	$4x10^{-8}$ $4x10^{-9}$	$3x10^{-4}$ $3x10^{-4}$
Silicon (14)	Si-31	S I	$6 \times 10^{-6}$ $1 \times 10^{-6}$	$3x10^{-2}$ $6x10^{-3}$	$2x10^{-7}$ $3x10^{-8}$	$9x10^{-4}$ $2x10^{-4}$

			Table I		Table II	
Element (atomic number)	Isotope	1	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Silver (47)	Ag-105 Ag-110m Ag-111	S I S I	6x10 <sup>-7</sup> 8x10 <sup>-8</sup> 2x10 <sup>-7</sup> 1x10 <sup>-8</sup> 3x10 <sup>-7</sup> 2x10 <sup>-7</sup>	$3 \times 10^{-3}$ $3 \times 10^{-3}$ $9 \times 10^{-4}$ $9 \times 10^{-4}$ $1 \times 10^{-3}$ $1 \times 10^{-3}$	$2 \times 10^{-8}$ $3 \times 10^{-9}$ $7 \times 10^{-9}$ $3 \times 10^{-10}$ $1 \times 10^{-8}$ $8 \times 10^{-9}$	$1 \times 10^{-4}$ $1 \times 10^{-4}$ $3 \times 10^{-5}$ $3 \times 10^{-5}$ $4 \times 10^{-5}$
Sodium (11)	Na-22 Na-24	S I S I	$2 \times 10^{-7}$ $9 \times 10^{-9}$ $1 \times 10^{-6}$ $1 \times 10^{-7}$	$1 \times 10^{-3}$ $9 \times 10^{-4}$ $6 \times 10^{-3}$ $8 \times 10^{-4}$	$6x10^{-9}$ $3x10^{-10}$ $4x10^{-8}$ $5x10^{-9}$	$4 \times 10^{-5}$ $3 \times 10^{-5}$ $2 \times 10^{-4}$ $3 \times 10^{-5}$
Strontium (38)	Sr-85m Sr-85 Sr-89 Sr-90 Sr-91 Sr-92	S I S I S I S I S I	4x10 <sup>-5</sup> 3x10 <sup>-5</sup> 2x10 <sup>-7</sup> 1x10 <sup>-7</sup> 3x10 <sup>-8</sup> 4x10 <sup>-8</sup> 1x10 <sup>-9</sup> 5x10 <sup>-9</sup> 4x10 <sup>-7</sup> 3x10 <sup>-7</sup> 3x10 <sup>-7</sup>	2x10 <sup>-1</sup> 2x10 <sup>-1</sup> 3x10 <sup>-3</sup> 5x10 <sup>-4</sup> 8x10 <sup>-4</sup> 1x10 <sup>-5</sup> 1x10 <sup>-3</sup> 2x10 <sup>-3</sup> 2x10 <sup>-3</sup> 2x10 <sup>-3</sup>	1x10 <sup>-6</sup> 1x10 <sup>-6</sup> 8x10 <sup>-9</sup> 4x10 <sup>-9</sup> 3x10 <sup>-10</sup> 1x10 <sup>-9</sup> 3x10 <sup>-11</sup> 2x10 <sup>-10</sup> 2x10 <sup>-8</sup> 9x10 <sup>-9</sup> 2x10 <sup>-8</sup> 1x10 <sup>-8</sup>	$7 \times 10^{-3}$ $7 \times 10^{-3}$ $1 \times 10^{-4}$ $2 \times 10^{-4}$ $3 \times 10^{-6}$ $3 \times 10^{-6}$ $3 \times 10^{-5}$ $7 \times 10^{-5}$ $5 \times 10^{-5}$ $6 \times 10^{-5}$
Sulfur (16)	S-35	S I	$3x10^{-7}$ $3x10^{-7}$	2x10 <sup>-3</sup> 8x10 <sup>-3</sup>	9x10 <sup>-9</sup> 9x10 <sup>-9</sup>	$6x10^{-5}$ $3x10^{-4}$
Tantalum (73)	Ta-182	S I	$4x10^{-8}$ $2x10^{-8}$	1x10 <sup>-3</sup> 1x10 <sup>-3</sup>	1x10 <sup>-9</sup> 7x10 <sup>-10</sup>	4x10 <sup>-5</sup> 4x10 <sup>-5</sup>

		_	Table I		Table II	
Element (atomic	Isotope	1	Column 1 Air	Column 2 Water	Column 1 Air	Column 2 Water
number)			(µCi/ml)	(µCi/ml)	(µCi/ml)	(µCi/ml)
Technetium(43)	Tc-96m	S	8x10 <sup>-5</sup>	4x10 <sup>-1</sup>	3x10 <sup>-6</sup>	1x10 <sup>-2</sup>
,		I	$3x10^{-5}$	$3x10^{-1}$	$1 \times 10^{-6}$	$1x10^{-2}$
	Tc-96	S	$6x10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1 \times 10^{-4}$
		I	$2x10^{-7}$	$1x10^{-3}$	$8 \times 10^{-9}$	$5x10^{-5}$
	Tc-97m	S	$2x10^{-6}$	$1x10^{-2}$	$8 \times 10^{-8}$	$4x10^{-4}$
		I	$2x10^{-7}$	$5x10^{-3}$	$5x10^{-9}$	$2x10^{-4}$
	Tc-97	S	$1x10^{-5}$	$5x10^{-2}$	$4x10^{-7}$	$2x10^{-3}$
	10 2 .	I	$3x10^{-7}$	$2x10^{-2}$	$1x10^{-8}$	$8 \times 10^{-4}$
	Tc-99m	S	$4x10^{-5}$	$2x10^{-1}$	$1x10^{-6}$	$6x10^{-3}$
	20 22	I	$1x10^{-5}$	$8x10^{-2}$	$5x10^{-7}$	$3x10^{-3}$
	Tc-99	S	$2x10^{-6}$	$1x10^{-2}$	$7x10^{-8}$	$3x10^{-4}$
	-0 ,,	Ĭ	$6x10^{-8}$	$5x10^{-3}$	$2x10^{-9}$	$2x10^{-4}$
Tellurium (52)	Te-125m	S	$4x10^{-7}$	$5x10^{-3}$	$1x10^{-8}$	$2x10^{-4}$
		I	$1x10^{-7}$	$3x10^{-3}$	$4x10^{-9}$	$1x10^{-4}$
	Te-127m	S	$1x10^{-7}$	$2x10^{-3}$	$5x10^{-9}$	$6x10^{-5}$
		I	$4x10^{-8}$	$2x10^{-3}$	$1x10^{-9}$	$5x10^{-5}$
	Te-127	S	$2x10^{-6}$	$8x10^{-3}$	$6x10^{-8}$	$3x10^{-4}$
		I	$9x10^{-7}$	$5x10^{-3}$	$3x10^{-8}$	$2x10^{-4}$
	Te-129m	S	$8x10^{-8}$	$1x10^{-3}$	$3x10^{-9}$	$3x10^{-5}$
		I	$3x10^{-8}$	$6x10^{-4}$	$1x10^{-9}$	$2x10^{-5}$
	Te-129	S	$5x10^{-6}$	$2x10^{-2}$	$2x10^{-7}$	$8x10^{-4}$
		I	$4x10^{-6}$	$2x10^{-2}$	$1x10^{-7}$	$8x10^{-4}$
	Te-131m	S	$4x10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$6x10^{-5}$
		I	$2x10^{-7}$	$1x10^{-3}$	$6x10^{-9}$	$4x10^{-5}$
	Te-132	S	$2x10^{-7}$	$9x10^{-4}$	$7x10^{-9}$	$3x10^{-5}$
		Ι	$1x10^{-7}$	$6x10^{-4}$	$4x10^{-9}$	$2x10^{-5}$
Terbium (65)	Tb-160	S	$1x10^{-7}$	$1x10^{-3}$	$3x10^{-9}$	$4x10^{-5}$
		Ι	$3x10^{-8}$	$1x10^{-3}$	$1x10^{-9}$	$4x10^{-5}$
Thallium (81)	T1-200	S	$3x10^{-6}$	$1x10^{-2}$	$9x10^{-8}$	$4x10^{-4}$
		I	$1x10^{-6}$	$7x10^{-3}$	$4x10^{-8}$	$2x10^{-4}$
	T1-201	S	$2x10^{-6}$	$9x10^{-3}$	$7 \times 10^{-8}$	$3x10^{-4}$
		I	$9x10^{-7}$	$5x10^{-3}$	$3x10^{-8}$	$2x10^{-4}$
	T1-202	S	$8x10^{-7}$	$4x10^{-3}$	$3x10^{-8}$	$1 \times 10^{-4}$
		I	$2x10^{-7}$	$2x10^{-3}$	$8 \times 10^{-9}$	$7x10^{-5}$
	T1-204	S	$6 \times 10^{-7}$	$3x10^{-3}$	$2x10^{-8}$	$1 \times 10^{-4}$
		Ι	$3x10^{-8}$	$2x10^{-3}$	$9x10^{-10}$	$6x10^{-5}$

		_	Table I		Table II	
Element	Isotope	1	Column 1	Column 2	Column 1	Column 2
(atomic			Air	Water	Air	Water
number)			(μCi/ml)	(µCi/ml)	(µCi/ml)	(μCi/ml)
Thorium (90)	Th-227	S	3x10 <sup>-10</sup>	5x10 <sup>-4</sup>	1x10 <sup>-11</sup>	2x10 <sup>-5</sup>
1110114411 (30)	111 22,	I	$2x10^{-10}$	$5x10^{-4}$	$6x10^{-12}$	$2x10^{-5}$
	Th-228	S	$9x10^{-12}$	$2x10^{-4}$	$3x10^{-13}$	$7x10^{-6}$
		Ĭ	$6x10^{-12}$	$4x10^{-4}$	$2x10^{-13}$	$1x10^{-5}$
	Th-230	S	$2x10^{-12}$	$5x10^{-5}$	$8x10^{-14}$	$2x10^{-6}$
		Ī	$1x10^{-11}$	$9x10^{-4}$	$3x10^{-13}$	$3x10^{-5}$
	Th-231	S	$1x10^{-6}$	$7x10^{-3}$	$5x10^{-8}$	$2x10^{-4}$
		I	$1x10^{-6}$	$7x10^{-3}$	$4x10^{-8}$	$2x10^{-4}$
	Th-232	S	$3x10^{-11}$	$5x10^{-5}$	$1x10^{-12}$	$2x10^{-6}$
		I	$3x10^{-11}$	$1x10^{-3}$	$1x10^{-12}$	$4x10^{-5}$
	Th-natural	S	$6x10^{-11}$	$6x10^{-5}$	$2x10^{-12}$	$2x10^{-6}$
		I	$6x10^{-11}$	$6x10^{-4}$	$2x10^{-12}$	$2x10^{-5}$
	Th-234	S	$6x10^{-8}$	$5x10^{-4}$	$2x10^{-9}$	$2x10^{-5}$
		I	$3x10^{-8}$	$5 \times 10^{-4}$	$1 \times 10^{-9}$	$2x10^{-5}$
Thulium (69)	Tm-170	S	$4x10^{-8}$	$1x10^{-3}$	$1 \times 10^{-9}$	5x10 <sup>-5</sup>
		I	$3x10^{-8}$	$1x10^{-3}$	$1x10^{-9}$	$5x10^{-5}$
	Tm-171	S	$1x10^{-7}$	$1x10^{-2}$	$4x10^{-9}$	$5x10^{-4}$
		I	$2x10^{-7}$	$1 \times 10^{-2}$	$8 \times 10^{-9}$	$5x10^{-4}$
Tin (50)	Sn-113	S	$4x10^{-7}$	$2x10^{-3}$	1x10 <sup>-8</sup>	9x10 <sup>-5</sup>
		I	$5x10^{-8}$	$2x10^{-3}$	$2x10^{-9}$	$8x10^{-5}$
	Sn-125	S	$1x10^{-7}$	$5x10^{-4}$	$4x10^{-9}$	$2x10^{-5}$
		I	$8x10^{-8}$	$5x10^{-4}$	$3x10^{-9}$	$2x10^{-5}$
Tungsten (74)	) W-181	S	$2x10^{-6}$	$1x10^{-2}$	$8x10^{-8}$	$4x10^{-4}$
<u> </u>		I	$1 \times 10^{-7}$	$1x10^{-2}$	$4x10^{-9}$	$3x10^{-4}$
	W-185	S	$8 \times 10^{-7}$	$4x10^{-3}$	$3x10^{-8}$	$1 \times 10^{-4}$
		I	$1 \times 10^{-7}$	$3x10^{-3}$	$4x10^{-9}$	$1 \times 10^{-4}$
	W - 187	S	$4x10^{-7}$	$2x10^{-3}$	$2x10^{-8}$	$7x10^{-5}$
		Ι	$3x10^{-7}$	$2x10^{-3}$	$1x10^{-8}$	$6x10^{-5}$

		T	able I		Table II	
Element (atomic number)	Isotope		olumn 1 Air uCi/ml)	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Uranium (92)	U-230	S I	3x10 <sup>-10</sup> 1x10 <sup>-10</sup>	1x10 <sup>-4</sup> 1x10 <sup>-4</sup>	1x10 <sup>-11</sup> 4x10 <sup>-12</sup>	5x10 <sup>-6</sup> 5x10 <sup>-6</sup>
	U-232	S I	$1 \times 10^{-10}$ $3 \times 10^{-11}$	8x10 <sup>-4</sup> 8x10 <sup>-4</sup>	$3x10^{-12}$ $9x10^{-13}$	$3x10^{-5}$ $3x10^{-5}$
	U-233	S I	$5x10^{-10}$ $1x10^{-10}$	$9x10^{-4}$ $9x10^{-4}$	$2x10^{-11}$ $4x10^{-12}$	$3x10^{-5}$ $3x10^{-5}$
	U-234	$\mathtt{S}^4$ I	$6x10^{-10}$ $1x10^{-10}$	9x10 <sup>-4</sup> 9x10 <sup>-4</sup>	$2x10^{-11}$ $4x10^{-12}$	$3x10^{-5}$ $3x10^{-5}$
	U-235	$\mathbb{S}^4$ I	$5x10^{-10}$ $1x10^{-10}$	$8 \times 10^{-4}$ $8 \times 10^{-4}$	$2x10^{-11}$ $4x10^{-12}$	$3x10^{-5}$ $3x10^{-5}$
	U-236	S I	$6x10^{-10}$ $1x10^{-10}$	$1 \times 10^{-3}$ $1 \times 10^{-3}$	$2x10^{-11}$ $4x10^{-12}$	$3x10^{-5}$ $3x10^{-5}$
	U-238	$\mathtt{S}^4$ I	$7x10^{-11}$ $1x10^{-10}$	$1 \times 10^{-3}$ $1 \times 10^{-3}$	$3x10^{-12}$ $5x10^{-12}$	$4x10^{-5}$ $4x10^{-5}$
	U-240	S I	$2x10^{-7}$ $2x10^{-7}$	$1 \times 10^{-3}$ $1 \times 10^{-3}$	$8 \times 10^{-9}$ $6 \times 10^{-9}$	$3x10^{-5}$ $3x10^{-5}$
	U-natural	S <sup>4</sup> I	$1 \times 10^{-10}$ $1 \times 10^{-10}$	$1 \times 10^{-3}$ $1 \times 10^{-3}$	$5x10^{-12}$ $5x10^{-12}$	$3x10^{-5}$ $3x10^{-5}$
Vanadium (23)	V-48	S I	$2x10^{-7}$ $6x10^{-8}$	$9x10^{-4}$ $8x10^{-4}$	6x10 <sup>-9</sup> 2x10 <sup>-9</sup>	$3x10^{-5}$ $3x10^{-5}$
Xenon (54)		Sub² Sub Sub Sub	$2x10^{-5}$ $1x10^{-5}$ $1x10^{-5}$ $4x10^{-6}$	  	4x10 <sup>-7</sup> 3x10 <sup>-7</sup> 3x10 <sup>-7</sup> 1x10 <sup>-7</sup>	  
Ytterbium(70)	Yb-175	S I	$7 \times 10^{-7}$ $6 \times 10^{-7}$	$3x10^{-3}$ $3x10^{-3}$	$2x10^{-8}$ $2x10^{-8}$	1x10 <sup>-4</sup> 1x10 <sup>-4</sup>

	<del>-</del>		Table I		Table 1	ΙΙ
Element (atomic number)	Isotope		Air	Column 2 Water (µCi/ml)	Column 1 Air (µCi/ml)	Column 2 Water (µCi/ml)
Yttrium (39)	Y-90	S I	1x10 <sup>-7</sup> 1x10 <sup>-7</sup>	6x10 <sup>-4</sup> 6x10 <sup>-4</sup>	4x10 <sup>-9</sup> 3x10 <sup>-9</sup>	2x10 <sup>-5</sup> 2x10 <sup>-5</sup>
	Y-91m	S	$2x10^{-5}$ $2x10^{-5}$	$1 \times 10^{-1}$ $1 \times 10^{-1}$	8x10 <sup>-7</sup> 6x10 <sup>-7</sup>	$3x10^{-3}$ $3x10^{-3}$
	Y-91	S	$4x10^{-8}$ $3x10^{-8}$	8x10 <sup>-4</sup> 8x10 <sup>-4</sup>	$1 \times 10^{-9}$ $1 \times 10^{-9}$	$3x10^{-5}$ $3x10^{-5}$
	Y-92	S	$4x10^{-7}$ $3x10^{-7}$	$2x10^{-3}$ $2x10^{-3}$	$1 \times 10^{-8}$ $1 \times 10^{-8}$	6x10 <sup>-5</sup> 6x10 <sup>-5</sup>
	Y-93	S	$2x10^{-7}$ $1x10^{-7}$	8x10 <sup>-4</sup> 8x10 <sup>-4</sup>	6x10 <sup>-9</sup> 5x10 <sup>-9</sup>	$3x10^{-5}$ $3x10^{-5}$
Zinc (30)	Zn-65	S I	1x10 <sup>-7</sup> 6x10 <sup>-8</sup>	3x10 <sup>-3</sup> 5x10 <sup>-3</sup>	$4x10^{-9}$ $2x10^{-9}$	1x10 <sup>-4</sup> 2x10 <sup>-4</sup>
	Zn-69m	S	$4x10^{-7}$ $3x10^{-7}$	$2x10^{-3}$ $2x10^{-3}$	$1 \times 10^{-8}$ $1 \times 10^{-8}$	$7x10^{-5}$ $6x10^{-5}$
	Zn-69	S I	$7x10^{-6}$ $9x10^{-6}$	$5x10^{-2}$ $5x10^{-2}$	$2x10^{-7}$ $3x10^{-7}$	$2x10^{-3}$ $2x10^{-3}$
Zirconium (40)	Zr-93 Zr-95	S I S I	1x10 <sup>-7</sup> 3x10 <sup>-7</sup> 1x10 <sup>-7</sup> 3x10 <sup>-8</sup>	$2x10^{-2}$ $2x10^{-2}$ $2x10^{-3}$ $2x10^{-3}$	4x10 <sup>-9</sup> 1x10 <sup>-8</sup> 4x10 <sup>-9</sup> 1x10 <sup>-9</sup>	$8 \times 10^{-4}$ $8 \times 10^{-4}$ $6 \times 10^{-5}$ $6 \times 10^{-5}$
	Zr-97	S	$1 \times 10^{-7}$ $9 \times 10^{-8}$	5x10 <sup>-4</sup> 5x10 <sup>-4</sup>	$4x10^{-9}$ $3x10^{-9}$	$2x10^{-5}$ $2x10^{-5}$

		Table I		Table II	
Element Is (atomic number)	-	Air	Water	Column 1 Air (µCi/ml)	Water
Any single radionuclide not listed above with decay mode other than alpha emissi spontaneous fissi with radioactive life less than 2	on or on and half-	1x10 <sup>-6</sup>		3x10 <sup>-8</sup>	
Any single radion not listed above decay mode other alpha emission or spontaneous fissi with radioactive life greater than	with than c on and half-	3x10 <sup>-9</sup>	9x10 <sup>-5</sup>	1x10 <sup>-10</sup>	3x10 <sup>-6</sup>
Any single radion not listed above, decays by alpha e or spontaneous fi	which emission	6x10 <sup>-13</sup>	4x10 <sup>-7</sup>	2x10 <sup>-14</sup>	3x10 <sup>-8</sup>

<sup>&</sup>lt;sup>1</sup> Soluble (S); Insoluble (I).

<sup>2</sup> "Sub" means that values given are for submersion in a semispherical infinite cloud of airborne material.

These radon concentrations are appropriate for protection from radon-222 combined with its short-lived daughters. Alternatively, the value in Table I may be replaced by onethird "working level." (A "working level" is defined as any combination of short-lived radon-222 daughters, polonium-218, lead-214, bismuth-214, and polonium-214, in 1 liter of air, without regard to the degree of equilibrium, that will result in the ultimate emission of  $1.3 \times 10^5$  MeV of alpha particle energy.) The Table II value may be replaced by one-thirtieth (1/30) of a "working level." The limit on radon-222 concentrations in restricted areas may be based on an annual average.

<sup>4</sup> For soluble mixtures of U-238, U-234 and U-235 in air chemical toxicity may be the limiting factor. If the percent by weight (enrichment) of U-235 is less than 5, the concentration value for a 40-hour workweek, Table I, is 0.2 milligrams uranium per cubic meter of air average. For any enrichment, the product of the average concentration and time of exposure during a 40hour workweek shall not exceed 8 x 10<sup>-3</sup> SA mCi-hr/ml, where SA is the specific activity of the uranium inhaled. concentration value for Table II is 0.007 milligrams uranium per cubic meter of air. The specific activity for natural uranium is  $6.77 \times 10^{-7}$  curies per gram uranium. The specific activity for other mixtures of U-238, U-235 and U-234, if not known, shall be:

> SA=  $3.6 \times 10^{-7}$  curies/gram U U-depleted SA=  $(C.4 + 0.38 E + 0.0034 E^2) 10^{-6} E $ 0.72$

where E is the percentage by weight of U-235, expressed as percent.

Note: In any case where there is a mixture in air or water of more than 1 radionuclide, the limiting values for purposes of this Appendix should be determined as follows:

If the identity and concentration of each radionuclide in the mixture are known, the limiting values should be derived as follows: Determine, for each radionuclide in the mixture, the ratio between the quantity present in the mixture and the limit otherwise established in Appendix A for the specific radionuclide when not in a mixture. The sum of such ratios for all the radionuclides in the mixture may not exceed "1" (i.e., "unity"). Example: If radionuclides a, b, and c are present in concentrations  $\rm C_{\rm a},\ C_{\rm b},\ and\ C_{\rm c},\ and\ if\ the\ applicable\ MPC's\ are$  $MPC_a$ ,  $MPC_b$ , and  $MPC_c$  respectively, then the concentrations shall be limited so that the following relationship exists:

$$\frac{C_a}{\frac{MPC_a}{MPC_b}} + \frac{C_b}{\frac{MPC_b}{MPC_c}} + \frac{C_c}{\frac{MPC_c}{MPC_c}} #1$$

- If either the identity or the concentration of any radionuclide in the mixture is not known, the limiting values for purposes of Appendix A shall be:
  - For purposes of Table I, Col. 1  $6x10^{-13}$
  - For purposes of Table I, Col. 2  $4x10^{-7}$

  - c. For purposes of Table II, Col. 1  $2 \times 10^{-14}$  d. For purposes of Table II, Col. 2  $3 \times 10^{-8}$
- 3. If any of the conditions specified below are met, the corresponding values specified below may be used in lieu of those specified in paragraph 2 above.
- a. If the identity of each radionuclide in the mixture is known but the concentration of 1 or more of the radionuclides in the mixture is not known, the concentration limit for the mixture is the limit specified in Appendix A for the radionuclide in the mixture having the lowest concentration limit; or
- If the identity of each radionuclide in the mixture is not known, but it is known that certain radionuclides specified in Appendix A are not present in the mixture, the concentration limit for the mixture is the lowest concentration limit specified in Appendix A for any radionuclide which is not known to be absent from the mixture; or

	Table I	г	Table II	
c. Radionuclide	Column 1	Water	Air	Water
If it is known that SR I-125, I-126,I-129, I-(I-133 Table II only), Po-210, At-211,Ra-223, Ra-226, Ac-227, Ra-228 Pa-231, Th-232, Th-nat Cf-254, and Fm-256 are not present	-90, 131, Fb-210, Ra-224, , Th-230,	9x10 <sup>-5</sup>		3x10 <sup>-6</sup>
If it is known that SR I-126, I-129, (I-131, II only), Pb-210, Po-2 Ra-226, Ra-228, Pa-231 Cm-248, Cf-254, and Fm not present	I-133 Table 10, Ra-223, , Th-nat, -256 are	6x10 <sup>-5</sup>		2x10 <sup>-6</sup>
If it is known that Sr (I-125, I-126, I-131, only), Pb-210, Ra-226, Cm-248, and Cf-254 are present	Table II Ra-228, not	2x10 <sup>-5</sup>		6x10 <sup>-7</sup>
If it is known that (I II only), Ra-226, and I are not present	Ra-228	3x10 <sup>-6</sup>		1x10 <sup>-7</sup>
If it is known that algand Sr-90, I-129, Pb-2 Ra-228, Pa-230, Pu-241 are not present	10, Ac-227, , and Bk-249		$1 \times 10^{-10}$	
If it is known that algand Pb-210, Ac-227, RaPu-241 are not present	-228, and		11x10 <sup>-11</sup>	
If it is known that almand Ac-227 are not present			$11 \times 10^{-12}$	
If it is known that AcPa-231, Pu-238, Pu-239 Pu-242, Pu-244, Cm-248 Cf-241 are not present	, Pu-240, , Cf-249 and		1x10 <sup>-13</sup>	

- 4. If a mixture of radionuclides consists of uranium and its daughters in ore dust prior to chemical separation of the uranium from the ore, the values specified below may be used for uranium and its daughters through radium-226, instead of those from paragraph 1, 2, or 3 above.
- a. For purposes of Table I, Column 1,  $1x10^{-10}~\mu\text{Ci/ml}$  gross alpha activity; or  $5x10^{-11}~\mu\text{Ci/ml}$  natural uranium; or 75 micrograms per cubic meter of air natural uranium.
- b. For purposes of Table II, Column 1,  $3x10^{-12}~\mu\text{Ci/ml}$  gross alpha activity;  $2x10^{-12}~\mu\text{Ci/ml}$  natural uranium; or 3 micrograms per cubic meter of air natural uranium.
- 5. For purposes of this note, a radionuclide may be considered as not present in a mixture if (a) the ratio of the concentration of that radionuclide in the mixture ( $C_a$ ) to the concentration limit for that radionuclide specified in Table II of Appendix A (MPC<sub>a</sub>) does not exceed 1/10, (i.e.,  $C_a/MPC_a\#1/10$ ) and (b) the sum of such ratios for all radionuclides considered as not present in the mixture does not exceed 1/4, (i.e.,  $C_a/MPC_a+C_b/MPC_b+\ldots$ #1/4).

#### APPENDIX B

(For use in ARM 37.14.725, 37.14.742, and 37.14.743)

Material	Microcuries Microcuries Microcuries
Americium-241	0.01
Antimony-122	100
Antimony-124	10
Antimony-125	10
Arsenic-73	100
Arsenic-74	10
Arsenic-76	10
Arsenic-77	100
Barium-131	10
Barium-133	10
Barium-140	10
Bismuth-210	1
Bromine-82	10
Cadmium-109	10
Cadmium-115m	10
Cadmium-115	100
Calcium-45	10
Calcium-47	10
Carbon-14	100
Cerium-141	100
Cerium-143	100
Cerium-144	1
Cesium-131	1,000
Cesium-134m	100
Cesium-134	1
Cesium-135	10
Cesium-136	10
Cesium-137	10
Chlorine-36	10
Chlorine-38	10
Chromium-51	1,000
Cobalt-58m	10
Cobalt-58	10
Cobalt-60	1
Copper-64	100
Dysprosium-165	10
Dysprosium-166	100
Erbium-169	100
Erbium-171	100
Europium-152 (9.2h)	100
Europium-152 (13 yr)	1
Europium-154	1
Europium-155	10
Fluorine-18	1,000

Material	Mi	crocuries
Gadolinium-153		10
Gadolinium-159		100
Gallium-72		10
Germanium-71		100
Gold-198		100
Gold-199		100
Hafnium-181		10
Holmium-166		100
Hydrogen-3		1,000
Indium-113m		100
Indium-114m		10
Indium-115m		100
Indium-115		10
Iodine-125		1
Iodine-126		1
Iodine-129		0.1
Iodine-131		1
Iodine-132		10
Iodine-133		1
Iodine-134		10
Iodine-135		10
Iridium-192		10
Iridium-194		100
Iron-55		100
Iron-59		10
Krypton-85		100
Krypton-87		10
Lanthanum-140		10
Lutetium-177		100
Manganese-52		10
Manganese-54		10
Manganese-56		10
Mercury-197m		100
Mercury-197		100
Mercury-203		10
Molybdenum-99		100
Neodymium-147		100
Neodymium-149		100
Nickel-59		100
Nickel-63		10
Nickel-65		100
Niobium-93m		10
Niobium-95		10
Niobium-97		10
Osmium-185		10
Osmium-191m		100
Osmium-191		100
Osmium-193		100
Palladium-103		100
ADMINISTRATIVE RULES OF MONTANA	3/31/00	37-2863
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Material	Microcuries
Palladium-109	100
Phosphorus-32	10
Platinum-191	100
Platinum-193m	100
Platinum-193	100
Platinum-197m	100
Platinum-197	100
Plutonium-239	0.01
Polonium-210	0.1
Potassium-42	10
Praseodymium-142	100
Praseodymium-143	100
Promethium-147	10
Promethium-149	10
Radium-226	0.01
Rhenium-186	100
Rhenium-188	100
Rhodium-103m	100
Rhodium-105	100
Rubidium-86	10
Rubidium-87	10
Ruthenium-97	100
Ruthenium-103	10
Ruthenium-105	10
Ruthenium-106	1
Samarium-151	10
Samarium-153	100
Scandium-46	10
Scandium-47	100
Scandium-48	10
Selenium-75	10
Silicon-31	100
Silver-105	10
Silver-110m	1
Silver-111	100
Sodium-22	10
Sodium-24	10
Strontium-85	10
Strontium-89	1
Strontium-90	0.1
Strontium-91	10
Strontium-92	10
Sulphur-35	100
Tantalum-182	10
Technetium-96	10
Technetium-97m	100
Technetium-97	100
Technetium-99m	100

Material	Microcuries
Technetium-99	10
Tellurium-125m	10
Tellurium-127m	10
Tellurium-127	100
Tellurium-129m	10
Tellurium-129	100
Tellurium-131m	10
Tellurium-132	10
Terbium-160	10
Thallium-200	100
Thallium-201	100
Thallium-202	100
Thallium-204	10
Thorium $(natural)^1$	100
Thulium-170	10
Thulium-171	10
Tin-113	10
Tin-125	10
Tungsten-181	10
Tungsten-185	10
Tungsten-187	100
Uranium (natural) <sup>2</sup>	100
Uranium-233	0.01
Uranium-234	
Uranium-235	0.01
Vanadium-48	10
Xenon-131m	1,000
Xenon-133	100
Xenon-135	100
Ytterbium-175	100
Yttrium-90	10
Yttrium-91	10
Yttrium-92	100
Yttrium-93	100
Zinc-65	10
Zinc-69m	100
Zinc-69	1,000
Zirconium-93	10
Zirconium-95	10
Zirconium-97	10

 $^{1}$  Based on alpha disintegration rate of Th-232, Th-230 and their daughter products.  $^{2}$  Based on alpha disintegration rate of U-238, U-234, and  $^{2}$ 

U-235.

<u>Material</u> <u>Microcuries</u>

Any alpha emitting radionuclide not listed above or mixtures of alpha emitters of unknown composition

0.01

Any radionuclide other than alpha emitting radionuclides, not listed above or mixtures of beta emitters of unknown composition

0.1

Note: For purposes of ARM 37.14.725, 37.14.742 and 37.14.743, where there is involved a combination of isotopes in known amounts, the limit for the combination should be derived as follows: determine, for each isotope in the combination, the ratio between the quantity present in the combination and the limit otherwise established for the specific isotope when not in combination may not exceed "1" (i.e., "unity"). Example: For purposes of ARM 37.14.743, if a particular batch contains 20,000  $\mu\text{Ci}$  of Au-198 and 50,000  $\mu\text{Ci}$  of C-14, it may also include not more than 300  $\mu\text{Ci}$  of I-131. This limit was determined as follows:

20,000 µCi Au-198/100,000 µCi + 50,000 µCi C-14/100,000 µCi

 $+ 300 \mu Ci I-131/1,000 \mu Ci = 1$ 

The denominator in each of the above ratios was obtained by multiplying the figure in the table by 1,000 as provided in ARM 37.14.743.

#### Subchapter 8

Radiation Safety Requirements for Industrial Radiographic Operations

- 37.14.801 PURPOSE (1) This subchapter establishes radiation safety requirements for persons utilizing sources of radiation for industrial radiography. The requirements of this subchapter are in addition to and not in substitution for other applicable requirements of this chapter. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS from DEQ, 2000 MAR p. 189.)
- 37.14.802 SCOPE (1) This subchapter applies to all licensees or registrants who use sources of radiation for industrial radiography. Except for those sections of this subchapter clearly applicable only to sealed radioactive sources, both radiation machines and sealed radioactive sources are covered by this subchapter. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.803 DEFINITIONS (1) As used in this subchapter, the following definitions apply:
- (a) "Enclosed radiography" means industrial radiography conducted in an enclosed cabinet or room and includes cabinet radiography and shielded room radiography.
- (i) "Cabinet radiography" means industrial radiography conducted in an enclosure or cabinet so shielded that every location on the exterior meets the conditions specified in ARM 37.14.710.
- (A) "Cabinet x-ray system" means an x-ray system with the x-ray tube installed in an enclosure (hereinafter termed "cabinet") which, independently of existing architectural structures except the floor on which it may be placed, is intended to contain at least that portion of a material being irradiated, provide radiation attenuation, and exclude personnel from its interior during generation of X radiation. Included are all x-ray systems designed primarily for the inspection of carry-on baggage at airline, railroad, and bus terminals, and in similar facilities. An x-ray tube used within a shielded part of a building, or x-ray equipment which may temporarily or occasionally incorporate portable shielding is not considered a cabinet x-ray system.
- (B) "Certified cabinet x-ray system" means an x-ray system which has been certified in accordance with 21 CFR 1010.2 as being manufactured and assembled pursuant to the provisions of 21 CFR 1020.40.

- (ii) "Shielded-room radiography" means industrial radiography conducted in a room so shielded that every location on the exterior meets the conditions specified in ARM 37.14.709.
- (b) "Industrial radiography" means the examination of the macroscopic structure of materials by nondestructive methods utilizing sources of radiation.
- (c) "Personal supervision" means supervision such that the supervisor is physically present at the radiography site and in such proximity that contact can be maintained and immediate assistance given as required.
- (d) "Radiographer" means any individual who performs, or provides personal supervision of, industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of this chapter and all license and/or certificate of registration conditions.
- (e) "Radiographer's assistant" means any individual who, under the personal supervision of a radiographer, uses sources of radiation, related handling tools, or radiation survey instruments in industrial radiography.
- (f) "Radiographic exposure device" means any instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise changed, from a shielded to unshielded position for purposes of making a radiographic exposure.
- (g) "Shielded position" means the location within the radiographic exposure device or storage container which, by manufacturer's design, is the proper location for storage of the sealed source.
- (h) "Storage container" means a device in which sealed sources are transported or stored. (History: Sec. 75-3-201, MCA; <u>IMP</u>, Sec. 75-3-201, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; <u>TRANS</u>, from DHES, 1996 MAR p. 433; <u>TRANS</u>, from DEQ, 2000 MAR p. 189.)

Rules 04 through 09 reserved

- 37.14.810 EQUIPMENT CONTROL: LIMITS ON LEVELS OF RADIATION (1) Radiographic exposure devices measuring less than 4 inches (10 centimeters) from the sealed source storage position to any exterior surface of the device shall have no radiation level in excess of 50 milliroentgens per hour at 6 inches (15 centimeters) from any exterior surface of the device. Radiographic exposure devices measuring a minimum of 4 inches (10 centimeters) from the sealed source storage position to any exterior surface of the device, and all storage containers for sealed sources or outer containers for radiographic exposure devices, shall have no radiation level in excess of milliroentgens per hour at any exterior surface, and 10 milliroentgens per hour at 1 meter from any exterior surface. The radiation levels specified are with the sealed source in the shielded (i.e., "off") position. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.811 EQUIPMENT CONTROL: LOCKING OF SOURCES OF RADIATION (1) Each source of radiation shall be provided with lock or lockable outer container designed to prevent unauthorized or accidental production of radiation or removal or exposure of a sealed source and shall be kept locked at all when under the direct surveillance except radiographer or radiographer's assistant, or as may be otherwise authorized pursuant to ARM 37.14.833. Each storage container likewise shall be provided with a lock and shall be kept locked when containing sealed sources except when the container is surveillance of under the direct а radiographer radiographer's assistant.
- (2) Radiographic exposure devices and storage containers, prior to being moved from 1 location to another and also prior to being secured at a given location, shall be locked and surveyed to assure that the sealed source is in the shielded position. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

# 37.14.812 EQUIPMENT CONTROL: STORAGE PRECAUTIONS

(1) Locked radiographic exposure devices, storage containers, and radiation machines shall be physically secured to prevent tampering or removal by unauthorized personnel. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.813 EQUIPMENT CONTROL: LEAK TESTING, REPAIR, TAGGING, OPENING, MODIFICATION, AND REPLACEMENT OF SEALED SOURCES (1) The replacement of any sealed source fastened to or contained in a radiographic exposure device and leak testing, repair, tagging, opening, or any other modification of any sealed source shall be performed only by persons specifically authorized to do so by the department, the US nuclear regulatory commission, or any agreement state.
- (2) Each sealed source shall be tested for leakage at intervals not to exceed 6 months. In the absence of a certificate from a transferor that a test has been made within the 6 month period prior to the transfer, the sealed source shall not be put into use until tested.
- (3) The leak test shall be capable of detecting the presence of 0.005 microcurie of removable contamination on the sealed source. An acceptable leak test for sealed sources in the possession of a radiography licensee would be to test at the nearest accessible point to the sealed source storage position, or other appropriate measuring point, by a procedure to be approved pursuant to ARM 37.14.540(5)(e). Records of leak test results shall be kept in units of microcuries and maintained for inspection by the department for 6 months after the next required leak test is performed or until the sealed source is transferred or disposed of.
- (4) Any test conducted pursuant to (2) and (3) of this rule which reveals the presence of 0.005 microcurie or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall cause it to be decontaminated and repaired or to be disposed of, in accordance with rules of the department. Within 5 days after obtaining results of the test, the licensee shall file a report with the department describing the equipment involved, the test results, and the corrective action taken.

(5) A sealed source which is not fastened to or contained in a radiographic exposure device shall have permanently attached to it a durable tag at least 1 inch square bearing the prescribed radiation caution symbol in conventional colors, magenta or purple on a yellow background, and at least the instructions:

> DANGER RADIOACTIVE MATERIAL DO NOT HANDLE NOTIFY CIVIL AUTHORITIES IF FOUND

(History: Sec. 75-3-201, MCA;  $\underline{IMP}$ , Sec. 75-3-201, MCA;  $\underline{NEW}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{TRANS}$ , from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 14 and 15 reserved

### 37.14.816 EQUIPMENT CONTROL: QUARTERLY INVENTORY

- (1) Each licensee shall conduct a quarterly physical inventory to account for all sealed sources received or possessed by him.
- (2) The records of the inventories shall be maintained for inspection by the department for 2 years from the date of the inventory and shall include the quantities and kinds of radioactive material, the location of sealed sources, and the date of the inventory. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.817 EQUIPMENT CONTROL: UTILIZATION LOGS (1) Each licensee or registrant shall maintain current logs, which shall be kept available for inspection by the department for 2 years from the date of the recorded event.
- (2) These logs shall show for each source of radiation the following information:
- A description, or make and model number, of each (a) source of radiation or storage container in which the sealed source is located.
  - The identity of the radiographer to whom assigned.
- (c) Locations where used and dates of use. (History: Sec. 75-3-204, MCA; <u>IMP</u>, Sec. 75-3-204, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 18 and 19 reserved

- 37.14.820 EQUIPMENT CONTROL: RADIATION SURVEY INSTRUMENTS
- (1) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by this subchapter and ARM 37.14.720. Instrumentation required by this rule shall have a range such that 2 milliroentgens per hour through 1 roentgen per hour can be measured.
  - (2) Each radiation survey instrument shall be calibrated:
- (a) at energies appropriate for use and at intervals not to exceed 3 months and after each instrument servicing;
- (b) such that accuracy within ± 20% can be demonstrated; and
- (c) at 2 or more widely separated points, other than zero, on each scale.
- (3) Records shall be kept of these calibrations for 2 years after the calibration date and maintained for inspection by the department. (History: Sec. 75-3-201, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-201, 75-3-202 and 75-3-204, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)
- 37.14.821 EQUIPMENT CONTROL: INSPECTION AND MAINTENANCE: RADIOGRAPHIC EXPOSURE DEVICES AND STORAGE CONTAINERS (1) Each licensee shall conduct a program of at least quarterly inspection and maintenance of radiographic exposure devices and storage containers to assure proper functioning of components important to safety. All appropriate parts shall be maintained in accordance with manufacturer's specification.
- (2) Records of inspection and maintenance shall be maintained for inspection by the department until it authorizes their disposal.
- (3) If any inspection conducted pursuant to this rule reveals damage to components critical to radiation safety, the device shall be removed from service until repairs have been made. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rule 22 reserved

- 37.14.823 EQUIPMENT CONTROL: INSPECTION AND MAINTENANCE: HIGH RADIATION AREA CONTROL DEVICES OR ALARM SYSTEMS (1) For any high radiation area equipped with a control device or alarm system as described in ARM 37.14.725(3)(b), the control device or alarm system shall be tested for proper operation at the beginning of each period of use.
- Records of such tests shall be maintained for inspection by the department until it authorizes their disposal. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-107 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 24 through 29 reserved

- 37.14.830 PERSONAL RADIATION SAFETY REQUIREMENTS FOR RADIOGRAPHERS AND RADIOGRAPHERS' ASSISTANTS: LIMITATIONS
- (1) No licensee or registrant shall permit any individual to act as a radiographer as defined in this subchapter until such individual:
- (a) has been instructed in the subjects outlined in Appendix A of this subchapter and shall have demonstrated understanding thereof;
- (b) has received copies of and instruction in this subchapter and the applicable rules of ARM Title 37, chapter 14, subchapters 7 and 17, and the appropriate license, and the licensee's or registrant's operating and emergency procedures, and shall have demonstrated understanding thereof; and
- (c) has demonstrated competence to use the source of radiation, radiographic exposure device, related handling tools, and radiation survey instruments which will be employed in his assignment.
- (2) No licensee or registrant shall permit any individual to act as a radiographer's assistant as defined in ARM 37.14.803(1)(e) until such individual:
- (a) has received copies of and instruction in the licensee's or registrant's operating and emergency procedures, and shall have demonstrated understanding thereof; and
- (b) has demonstrated competence to use, under the personal supervision of the radiographer, the sources of radiation, radiographic exposure device, related handling tools, and radiation survey instruments which will be employed in his assignment.
- (3) Each licensee or registrant shall maintain, for inspection by the department until it authorizes their disposal, records of training and testing which demonstrate that the requirements of this rule are met. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.831 PERSONAL RADIATION SAFETY REQUIREMENTS FOR RADIOGRAPHERS AND RADIOGRAPHERS' ASSISTANTS: OPERATING AND EMERGENCY PROCEDURES (1) The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:
- (a) The handling and use of sources of radiation to be employed such that no individual is likely to be exposed to radiation doses in excess of the limits established in ARM Title 37, chapter 14, subchapter 7.
- (b) Methods and occasions for conducting radiation surveys.
  - (c) Methods for controlling access to radiographic areas.
- (d) Methods and occasions for locking and securing sources of radiation.
- (e) Personnel monitoring and the use of personnel monitoring equipment.
- (f) Transportation to field locations, including packing of sources of radiation in the vehicles, posting of vehicles, and control of sources of radiation during transportation.
- (g) Minimizing exposure of individuals in the event of an accident.
- (h) The procedure for notifying proper personnel in the event of an accident.
  - (i) Maintenance of records.
- (j) The inspection and maintenance of radiographic exposure devices and storage containers, and radiation machines. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.832 PERSONAL RADIATION SAFETY REQUIREMENTS FOR RADIOGRAPHERS AND RADIOGRAPHERS' ASSISTANTS: PERSONNEL MONITORING CONTROL (1) No licensee or registrant shall permit any individual to act as a radiographer or as a radiographer's assistant unless, at all times during radiographic operations, each such individual wears a direct reading pocket dosimeter and either a film badge or a thermoluminescent dosimeter. Pocket dosimeters shall have a range from zero to at least 200 milliroentgens and shall be recharged daily or at the start of each shift. Each film badge or thermoluminescent dosimeter shall be assigned to and worn by only 1 individual.
- (2) Pocket dosimeters shall be read and exposure recorded daily. An individual's film badge or thermoluminescent dosimeter shall be immediately processed if his pocket dosimeter is discharged beyond its range. Reports received from the film badge or thermoluminescent dosimeter processor and records of the pocket dosimeter readings shall be maintained for inspection by the department until it authorizes their disposal. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.833 PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC OPERATIONS: SECURITY (1) During each radiographic operation, the radiographer or radiographer's assistant shall maintain a direct surveillance of the operation to protect against unauthorized entry into a high radiation area, as defined in ARM Title 37, chapter 14, subchapter 1, except:
- (a) where the high radiation area is equipped with a control device or alarm system as described in ARM 37.14.725(3)(b), or
- (b) where the high radiation area is locked to protect against unauthorized or accidental entry. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 34 through 39 reserved

- 37.14.840 PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC OPERATIONS: POSTING (1) Notwithstanding any provisions in ARM 37.14.726(1)(c), areas in which radiography is being performed shall be conspicuously posted as required by ARM 37.14.725(2) and (3)(a). (History: Sec. 75-3-201, MCA, <u>IMP</u>, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC 37.14.841 OPERATIONS: RADIATION SURVEYS AND SURVEY RECORDS radiographic operation shall be conducted unless calibrated and operable radiation survey instrumentation as described in ARM 37.14.820 is available and used at each site where radiographic exposures are made.
- (2) A physical radiation survey shall be made after each radiographic exposure utilizing radiographic exposure devices or sealed sources of radioactive material to determine that the sealed source has been returned to its shielded position.
- (3) A physical radiation survey shall be made to determine that each sealed source is in its shielded position prior to securing the radiographic exposure device or storage container as specified in ARM 37.14.811.
- Records shall be kept of the surveys required by (3) of this rule. Such records shall be maintained for inspection by the department for 2 years after completion of the survey. If the survey was used to determine an individual's exposure, however, the records of the survey shall be maintained until the department authorizes their disposition. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 42 through 44 reserved

- 37.14.845 PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC OPERATIONS: RECORDS REQUIRED AT TEMPORARY JOB SITES (1) Each licensee or registrant conducting industrial radiography at a temporary site shall have the following records available at that site for inspection by the department:
  - (a) Appropriate license or equivalent document.
  - (b) Operating and emergency procedures.
  - (c) Applicable regulations.
- (d) Survey records required pursuant to ARM 37.14.841 for the period of operation at the site.
- (e) Daily pocket dosimeter records for the period of operation at the site.
- (f) The latest instrument calibration and leak test record for specific devices in use at the site. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.846 PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC OPERATIONS: SPECIAL REQUIREMENTS AND EXEMPTIONS FOR ENCLOSED RADIOGRAPHY (1) Systems for enclosed radiography designed to allow admittance of individuals shall:
- (a) Comply with all applicable requirements of this subchapter and ARM 37.14.710. If such a system is a certified cabinet x-ray system, it shall comply with all applicable requirements of this subchapter and 21 CFR 1020.40.
- (b) Be evaluated at intervals not to exceed 1 year to assure compliance with the applicable requirements as specified in (a) above.
- (i) Records of these evaluations shall be maintained for inspection by the department for a period of 2 years after the evaluation.
- (2) Cabinet x-ray systems designed to exclude individuals are exempt from the requirements of this subchapter except that:
- (a) Operating personnel must be provided with either a film badge or a thermoluminescent dosimeter and reports of the results must be maintained for inspection by the department.
- (b) No registrant shall permit any individual to operate a cabinet x-ray system until such individual has received a copy of and instruction in the operating procedures for the unit and has demonstrated competence in its use. Records which demonstrate compliance with this subsection shall be maintained for inspection by the department until disposition is authorized by the department.
- (c) Tests for proper operation of high radiation area control devices or alarm systems, where applicable, must be conducted and recorded in accordance with ARM 37.14.823.

- The registrant shall perform an evaluation at intervals not to exceed 1 year, to determine conformance with ARM 37.14.710. If such a system is a certified cabinet x-ray system, it shall be evaluated at intervals not to exceed 1 year to determine conformance with 21 CFR 1020.40.
- (i) Records of these evaluations shall be maintained for inspection by the department for a period of 2 years after the evaluation.
- (3) Certified cabinet x-ray systems shall be maintained in compliance with 21 CFR 1020.40 unless prior approval has been granted by the department pursuant to ARM 37.14.106. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

#### RADIATION CONTROL

#### APPENDIX A

Subjects to be covered during the instruction of radiographers

- Fundamentals of Radiation Safety
  - Characteristics of radiation
  - В. Units of radiation dose (mrem) and quantity of radioactivity (curie)
  - C. Significance of radiation dose
    - 1. Radiation protection standards
    - 2. Biological effects of radiation dose
  - Levels of radiation from sources of radiation
  - Methods of controlling radiation dose
    - 1. Working time
    - 2. Working distances
    - 3. Shielding

### Radiation Detection Instrumentation to be Used

- A. Use of radiation survey instruments
  - 1. Operation
  - 2. Calibration
  - 3. Limitations
- Survey techniques
- Use of personnel monitoring equipment
  - 1. Film badges
  - 2. Thermoluminescent dosimeters
  - 3. Pocket dosimeters

#### III. Radiographic Equipment to be Used

- A. Remote handling equipment
- В. Radiographic exposure devices and sealed sources
- C. Storage containers
- Operation and control of x-ray equipment
- The Requirements of Pertinent Federal and State Regulations IV.
- V. The Licensee's or Registrant's Written Operating and Emergency Procedures

Subchapter 9 reserved

#### Subchapter 10

#### X-Rays in the Healing Arts

37.14.1001 SCOPE (1) This subchapter establishes requirements for use of x-ray producing devices in the healing arts by a practitioner licensed by law to use or direct the use of such devices in the course of his professional practice or upon a prescription or other order lawfully issued in the course of his professional practice. The provisions of this subchapter are in addition to, and not in substitution for, other applicable provisions of this chapter. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### 37.14.1002 DEFINITIONS As used in this subchapter:

- (1) "Aluminum equivalent" means the thickness of aluminum affording the same attenuation, under specified conditions, as the material in question.
- (2) "Diagnostic-type tube housing" means an x-ray tube housing so constructed that leakage radiation at a distance of one meter from the target cannot exceed 100 milliroentgens in one hour when the tube is operated at any of its specified ratings.
- (3) "Enabling switch or momentary switch" means an underwriters laboratory (UL) or factory mutual (FM) switch so constructed that a single depression by the operator will provide a single exposure and that continuous pressure by the operator does not provide a continuous or multiple exposure.
- (4) "Filter" means material placed in the useful beam to absorb preferentially the less penetrating radiations.
- (5) "Half-value layer (hvl)" means the thickness of an absorber required to reduce a beam of radiation to one-half its incident exposure rate.
- (6) "Inherent filtration" means the filtration in the useful beam due to the window of the x-ray tube and any permanent tube enclosure.
- (7) "Interlock" means a device for precluding access to an area of radiation hazard either by preventing entry or by automatically removing the hazard.
- (8) "Kilovolts peak (kVp)" means the crest value in kilovolts of the potential of a pulsating potential generator. When only one-half of the wave is used, the value refers to the useful half of the wave.
- (9) "Lead equivalent" means the thickness of lead affording the same attenuation, under specified conditions, as the material in question.
- (10) "Leakage radiation" means all radiation coming from within the tube housing except the useful beam.

- (11) "NCRP" means the national council on radiation protection and measurements.
- (12) "Primary protective barrier" means a barrier sufficient to attenuate the useful beam to the required degree.
- (13) "Protective apron" means an apron made of attenuating materials used to reduce radiation exposure.
- (14) "Protective barrier" means a barrier of attenuating materials used to reduce radiation exposure.
- (15) "Protective glove" means a glove made of attenuating materials used to reduce radiation exposure.
- (16) "Qualified expert" means a health physicist, medical physicist, radiologist, or other individual who can competently perform the calculations necessary to provide shielding requirements within the standards of this chapter.
- (17) "Scattered radiation" means radiation that, during passage through matter, has been deviated in direction.
- (18) "Secondary protective barrier" means a barrier sufficient to attenuate stray radiation to the required degree.
- (19) "Shutter" means a device, generally of lead, fixed to an x-ray tube housing to intercept the useful beam.
- (20) "Stray radiation" means radiation not serving any useful purpose. It includes leakage and secondary radiation.
- (21) "Therapeutic-type tube housing" means an x-ray tube housing so constructed that the leakage radiation at a distance of one meter from the target cannot exceed one roentgen in one hour; and at a distance of five centimeters from any point on the surface of the housing accessible to the patient cannot exceed 30 roentgens in one hour when the tube is operated at any of its specified ratings.
- (22) "Useful beam" means that part of the radiation which passes through the window, aperture, cone, or other collimating device of the tube housing. (History: Sec. 50-79-201 and 75-3-201, MCA; IMP, Sec. 50-79-101, 50-79-102, 50-79-103 and 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189; AMD, 2003 MAR p. 1291, Eff. 7/1/03; AMD, 2003 MAR p. 2443, Eff. 10/31/03.)
- 37.14.1003 GENERAL SAFETY PROVISIONS (1) Diagnostic x-ray systems, for use on humans, and their associated components certified pursuant to the federal diagnostic x-ray standard shall be maintained in compliance with applicable requirements of such standard as set forth in 21 CFR, chapter I, subchapter J, as revised on April 1, 2003. The department may waive compliance with the specific requirements of this subchapter by an existing machine or installation if the registrant demonstrates, to the department's satisfaction, achievement through other means of radiation protection equivalent to that required by this chapter.

- (2) No person shall make, sell, lease, transfer, lend or install x-ray equipment or the supplies used in connection with such equipment unless such supplies and equipment, when properly placed in operation and properly used, will meet the requirements of this chapter. This includes responsibility for the delivery of cones or collimators, diaphragms and adjustable diaphragms, filters, adequate timers, and fluoroscopic shutters, where applicable.
- (3) Personnel monitoring shall be performed in controlled areas for each occupationally exposed individual for a minimum of a 13-week period starting each January. When a protective apron is worn, the monitoring device shall be worn at the collar outside of the apron.
- (4) Safety requirements concerning the use of radiation sources are that:
- (a) The registrant shall be responsible for radiation safety. He is responsible for assuring that radiation sources under his jurisdiction are used only by persons competent to use them. He is responsible for providing the instruction of personnel in safe operating procedures.
- (b) A radiation safety officer, who may be the registrant himself, shall be designated for every installation and shall be approved by the department as per ARM 37.14.307(1)(b), if other than a licensed member of the healing arts.
  - (c) The radiation safety officer shall:
- (i) establish and supervise operating procedures and review them periodically to assure their conformity with this chapter;
- (ii) provide personnel with instruction on proper radiation protection practices;
- (iii) conduct radiation surveys and source leak tests where indicated and keep records of such surveys and tests, including summaries of corrective measures recommended and/or instituted;
- (iv) assure that personal monitoring devices are used where indicated and that records are kept of the results of such monitoring;
- (v) assure that interlock switches and warning signals are functioning and that signs are properly located; and
- (vi) investigate each known or suspected case of excessive or abnormal exposure to determine the cause and to take steps to prevent its recurrence.
- (d) The registrant shall provide safety rules to each individual operating x-ray equipment under his control, including any restrictions of the operating technique required for the safe operation of the particular x-ray apparatus, and require that the operators demonstrate familiarity with these safety rules.

- (e) Deliberate exposure of an individual to the useful beam for training or demonstration purposes shall not be permitted unless there is also a medical or dental indication for the exposure and the exposure is prescribed by a practitioner of the healing arts.
- (5) The general shielding safety requirements are as follows:
- (a) Before construction, the floor plans and equipment arrangement of medical installations (new or modifications of existing installations) utilizing x-rays for diagnostic or therapeutic purposes shall be submitted to a qualified expert for determination of shielding requirements consistent with National Council on Radiation Protection (NCRP) and Measurements Reports No. 49 and 51, and 10 CFR part 20, as revised on January 1, 2003.
- (b) A letter shall be submitted by the qualified expert to the department within 30 days of the project completion. The letter must contain at least the following information:
  - (i) name, address and credentials of the qualified expert;
  - (ii) facility site name, address and telephone number;
  - (iii) facility owner's name, address and telephone number;
  - (iv) date of installation;
  - (v) name and address of the manufacturer; or
- (vi) if a used or reconditioned device is installed, the name and address of the previous facility or the owner of origin.
- (c) Each installation shall be provided with such primary protective barriers and/or secondary protective barriers as are necessary to assure compliance with ARM 37.14.705, 37.14.708 and 37.14.709. This requirement shall be deemed to be met if the thickness of such barriers are equivalent to those as computed by a qualified expert and are consistent with the NCRP Reports No. 49 and 51 and 10 CFR part 20, as revised on January 1, 2003.
- (d) Lead barriers shall be bonded to panels of rigid supporting material in such a manner that they will not sag or cold-flow because of their own weight and shall be protected against mechanical damage. Lead shielding less than one mm thick shall be bonded to panels of some rigid supporting material. The minimum allowable thickness of lead is 0.79mm (1/32 inches or two pounds per square foot).
- (e) Joints between different kinds of protective materials shall be so designed that the overall protection afforded by the barrier is not impaired.

- (f) Joints at the floor and ceiling shall be so designed that the overall protection is not impaired.
- (g) Windows, window frames, doors, and door frames shall have the same lead equivalent as that required of the adjacent wall.
- (h) Holes in protective barriers shall be covered so that overall protection is not impaired.
- (6) For new and modified installations only, the following are minimum design requirements for medical x-ray machine operator booths in conjunction with ARM 37.14.1006, 37.14.1010, 37.14.1011, 37.14.1012, 37.14.1020, 37.14.1021 and 37.14.1022. The requirements specified under (6), (7), (8) and their subsections do not apply to podiatry and veterinary The requirements specified under (6) through installations. (6)(b)(iii), (6)(d) through (6)(f)(ii) do not apply to dental See (7) and (8) for dental panoramic and installations. cephalometric requirements.
- (a) The operator shall be allotted 0.7 sq. meters (7.5 sq.) ft.) or more of unobstructed floor space in the x-ray booths.
- (i) The 0.7 sq. meters (7.5 sq. ft.) of minimum space specified under (6)(a) shall be a geometric configuration where no dimension is less that 61.0 centimeters (2.0 ft.).
- (ii) The allotted space shall exclude an encumbrance by the console, such as an overhang, cables or other similar encroachment.
- (iii) An extension of straight line drawn between any point on the edge of the booth shielding and the nearest vertical edge of a vertical cassette holder, corner of the examination table or any part of the tube housing assembly shall not impinge on the unobstructed space.
- (iv) The booth walls shall be 2.1 meters high (7.0 ft.) or more and shall be permanently fixed.
- (v) When a door or moveable panel is used as the integral part of the booth structure, it must have a permissive device, which will prevent an exposure when the door panel is not closed.
- (b) The operator's switch for the radiographic machine shall be fixed within the booth. The switch shall:
- (i) be located so that it is impossible to make an exposure when the operator is outside of the protected area;
- (ii) allow the operator to use the available viewing windows; and
- (iii) be constructed so that a single depression by the operator will provide a single exposure and that continuous pressure by the operator does not provide a continuous or multiple exposure.
- (c) Each booth shall have at least one viewing device, which shall:

- (i) be placed so the operator can have full view of the entries into the room; and
- (ii) be placed so that the operator can view the patient during exposure.
- (d) When the viewing system is a window, the following requirements also apply:
- (i) the window shall have a visible area of 930 square centimeters (1.0 square foot) or more; and
- (ii) the glass shall have the same lead equivalence or more as that required in the booth's wall where the glass is mounted.
- (e) When the viewing system is by mirrors, the mirrors shall be located to accomplish the general requirements under (6)(c).
- (f) When the viewing system is by electronic means (for example, tv):
- (i) the camera shall be located to accomplish the general requirements under (6)(c); and
- (ii) there shall be an alternative viewing system as a backup for electronic failure.
- (7) Dimensions of primary beam shielding shall exceed the largest possible beam size by 30.5 centimeters (1.0 foot) or more in every direction. Cephalometric primary beam shielding shall be deemed adequate if, for a maximum workload of 20 films a week, two-pound lead is installed (for occupied areas).
- (8) A viewing device shall be present in dental panoramic and cephalometric x-ray installations, so that the requirements of (6)(c) are met.
- (9) Council on Radiation Protection National Measurements Reports No. 49 and 51, 10 CFR part 20, as revised on January 1, 2003 and 21 CFR, chapter I, subchapter J, as revised on April 1, 2003, are incorporated into this chapter by this reference. The reports and CFR pertain to requirements for radiation protection and measurements. Copies of National Council on Radiation Protection and Measurements Reports No. 49 and 51, 10 CFR part 20 and 21 CFR, chapter I, subchapter J are available for viewing at the Department of Public Health and Human Services, Quality Assurance Division, Licensure Bureau, 2401 Colonial Drive, Helena, MT. (History: Sec. 50-79-201, 50-79-202, 50-79-204, 75-3-201 and 75-3-204, MCA; <u>IMP</u>, Sec. 50-79-101, 50-79-102, 50-79-103, 50-79-104, 50-79-105, 50-79-106, 50-79-107, 50-79-108, 50-79-201, 50-79-202, 50-79-203, 50-79-204 and 75-3-201, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; <u>TRANS</u>, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189; AMD, 2003 MAR p. 1291, Eff. 7/1/03; AMD, 2003 MAR p. 2443, Eff. 10/31/03.)

### Rule 04 reserved

- 37.14.1005 PROHIBITED USE (1) No registrant shall operate or permit the operation of x-ray equipment unless the equipment and installations meet the applicable requirements of this chapter. (History: Sec. 75-3-201, MCA; Sec. IMP, 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1006 FLUOROSCOPIC INSTALLATIONS (1) The equipment used in fluoroscopic installation shall be as follows:
  - (a) The tube housing shall be of a diagnostic type.
- (b) During fluoroscopy and cinefluorography, the kV and the mA shall be continuously indicated.
  - (c) The source to skin distance shall not be less than:
- (i) 38 centimeters on stationary fluoroscopes installed after March 28, 1980.
- (ii) 35.5 centimeters on stationary fluoroscopes which are in operation prior to March 28, 1980;
  - (iii) 30 centimeters on all mobile fluoroscopes; and
- (iv) 20 centimeters for image intensified fluoroscopes used for specific surgical application. The users operating manual must provide precautionary measures to be adhered to during the use of this device.
- (d) The total filtration permanently in the useful beam shall be at least 2.5 millimeters aluminum equivalent.
- (e) The equipment shall be so constructed that, under conditions of normal use, the entire cross section of the useful beam is attenuated by a primary protective barrier, permanently incorporated into the equipment and the exposure shall automatically terminate when the barrier is removed from the useful beam.
- (i) The lead equivalent of the barrier of conventional fluoroscopes shall be at least 1.5 millimeters for equipment capable of operating up to 100 kVp, at least 1.8 millimeters for equipment capable of operating between 100 kVp and 125 kVp, and at least 2 millimeters for equipment capable of operating between 125 kVp and 150 kVp.
- (ii) With the fluorescent screen 14 inches (35 cm) from the panel or table top, the exposure rate 2 inches (5 cm) beyond the viewing surface of the screen shall not exceed 30 mR/hr. for each R per minute at the table top with the screen in the useful beam without a patient and with the fluoroscope operating at its highest possible potential.

- (iii) A collimator shall be provided to restrict the size of the useful beam to less than the area of the barrier. The x-ray tube and collimating system shall be linked with the fluorescent screen assembly so that the useful beam at the fluorescent screen is confined within the barrier irrespective of the panel-screen distance. For all new fluoroscopic units with image intensifiers sold in Montana after July 1, 1969, the useful beam shall be centered on the input phosphor and during fluoroscopy or cine recording shall not exceed the diameter of the input phosphor.
- (iv) When the adjustable diaphragm is opened to its fullest extent, an unilluminated margin shall exist at all edges of the fluorescent screen when the screen is 14 inches (35 cm) from the panel surface or table top or at the fixed screen position in equipment such as orthodiascopes. In equipment used solely for image intensified fluoroscopy, the shutter shall restrict the useful beam within the diameter of the input phosphor.
- (v) Collimators, adjustable diaphragms and shutters shall provide the same degree of attenuation as is required of the tube housing.
- (f) The fluoroscopic exposure switch shall be a dead-man switch type.
- (g) A shielding device of at least 0.25 millimeters lead equivalent for covering the Bucky slot during fluoroscopy shall be provided on all new units sold in Montana after July 1, 1969.
- (h) A shield of at least 0.25 millimeters lead equivalent such as overlapping protective drapes or hinged or sliding panels shall be provided on all new units sold in Montana after July 1, 1969, to intercept scattered radiation which would otherwise reach the fluoroscopist and others near the machine.
- (i) A cumulative timing device activated by the fluoroscope exposure switch shall be provided. It shall indicate the passage of a predetermined period of irradiation either by an audible signal or by temporary interruption of the irradiation when the increment of exposure time reaches a predetermined limit not exceeding 5 minutes.
- (j) Image intensification shall always be provided on mobile fluoroscopic equipment. It shall be impossible to operate mobile fluoroscopic equipment unless the useful beam is intercepted by the image intensifier.
- (k) Provision shall be made to intercept the scattered x-rays from the undersurface of the table top and other structures under the table. The shieldings shall provide the same degree of attenuation as is required of the tube housing, with the incident angle of the useful beam taken into consideration.

- (1) Equipment to be operated in areas where explosive gases may be used shall have the approval of underwriters laboratory for such use.
- (2) Ordinarily, only secondary protective barriers shall be required for shielding in fluoroscopic installations except for combined fluoroscopic-radiographic installations.
- (3) The operating procedures for fluoroscopic installation areas are as follows:
- (a) The allowable limits for entrance exposure rates are as follows:
- (i) The exposure measured at the point where the center of the useful beam enters the patient shall not exceed 10 roentgens per minute, except during recording of fluoroscopic images or when provided with optional high level control.
- (ii) When provided with optional high level control, the equipment shall not be operable at any combination of tube potential and current which will result in an exposure rate in excess of 5 roentgens per minute at the point where the center of the useful beam enters the patient unless the high level control is activated.
- (A) Special means of activation of high level controls shall be required. The high level control shall only be operable when continuous manual activation is provided by the operator.
- (b) A continuous signal audible to the fluoroscopist shall indicate that the high level control is being employed.
- (iii) In addition to the other requirements, equipment which does not incorporate an automatic exposure control shall not be operable at any combination of tube potential and current which will result in an exposure rate in excess of 5 roentgens per minute at the point where the center of the beam enters the patient except during recording of fluoroscopic images or when provided with an optional high level control.
- (iv) Compliance with the requirements of (a) above shall be determined as follows:
- (A) Movable grids and compression devices shall be removed from the useful beam during the measurement.
- (B) If the source is below the table, exposure rate shall be measured 1 centimeter above the table top or cradle.
- (C) If the source is above the table, the exposure rate shall be measured at 30 centimeters above the table top with the end of the beam-limiting device or spacer positioned as closely as possible to the point of measurement.
- (D) In a C-arm type of fluoroscope, the exposure rate shall be measured 30 centimeters from the input surface of the fluoroscopic imaging assembly.
- (b) The fluoroscopist's eyes shall be sufficiently dark adapted (20 minutes) for the visual task required before commencing fluoroscopy.

- (c) Extraneous light that interferes with the fluoroscopic examination shall be eliminated.
- (d) Protective aprons of at least 0.25 millimeters lead equivalent shall be worn in the fluoroscopy room by each person except the patient.
- (e) Only persons whose presence is necessary shall be in
- the fluoroscopy room during x-ray exposures.

  (f) Fluoroscopy shall not be used as a substitute for radiography but shall be reserved for the study of dynamics or spatial relationships or for guidance in spot-film recording of critical details.
- Special precautions, consistent with clinical needs, shall be taken to minimize exposure of the gonads of potentially procreative patients and exposure of the embryo or fetus in patients known to be or suspected of being pregnant.
- (h) Notwithstanding ARM 37.14.721, personnel monitoring is required for each individual who enters a controlled area. (History: Sec. 75-3-201 and 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 07 through 09 reserved

- 37.14.1010 DENTAL RADIOGRAPHIC INSTALLATIONS (1) The equipment used in dental radiographic installations shall be as follows:
  - (a) The tube housing shall be of diagnostic type.
- (b) Diaphragms or cones shall be used for collimating the useful beam and provide the same degree of protection as the housing. The diameter of the useful beam at the cone tip shall not be more than 2-3/4 inches for intra-oral radiography.
- (c) A cone or spacer frame shall provide a target-to-skin distance of not less than 7 inches with apparatus operating above 50 kVp or 4 inches with apparatus operating at 50 kVp or below.
- (d) For equipment capable of operating up to no more than 70 kVp, the total filtration permanently in the useful beam shall be equivalent to at least 1.5 mm of aluminum. This requirement may be assumed to have been met if the half-value layer is not less than 1.5 mm aluminum at maximum possible operating voltages.
- (e) For equipment capable of operating above 70 kVp, the total filtration permanently in the useful beam shall be equivalent to at least 2.5 mm of aluminum. This requirement may be assumed to have been met if the half-value layer is not less than 2.5 mm aluminum at the maximum possible operating voltage.
- (f) Means shall be provided to terminate the exposure at a preset time interval, preset product of current and time, a preset number of pulses, or a preset radiation exposure to the image receptor. In addition:
- (i) It shall not be possible to make an exposure when the timer is set to a "zero" or "off" position if either position is provided.
- (ii) With a timer setting of 0.5 seconds or less, the average exposure period (T) shall be greater than or equal to 5 times the maximum exposure period  $(T_{\text{max}})$  minus the minimum exposure period  $(T_{\text{min}})$  when 4 timer tests are performed, i.e.,
- T \$ 5( $T_{max}$   $T_{min}$ ). (g) An x-ray control shall be incorporated into each x-ray system such that an exposure can be terminated by the operator at any time, except for exposure of one-half second or less.
- (h) Each installation shall be provided with a protective barrier for the operator or shall be so arranged that the operator can stand at least 12 feet from the useful beam. Stationary x-ray systems installed after July 1, 1980, shall be required to have the x-ray control permanently mounted in a protected area, e.g., corridor outside the room, so that the operator is required to remain in that protected area during the entire exposure.
- (2) The structural shielding requirements for dental radiographic installations shall be as follows:

- (a) Dental rooms containing x-ray machines shall be provided with primary protective barriers at all areas struck by the useful beam. Consideration shall be given to the attenuation provided by the patient and the building materials in partitions.
- (b) When dental x-ray units are installed in adjacent rooms or areas, protective barriers shall be provided between the rooms or areas. Consideration of the effects of the separating wall(s) shall be given in the evaluation of this protection.
- (3) The operating procedures applicable to dental radiographic installations shall be as follows:
- (a) Neither the dentist nor his assistant shall be permitted to hold patients or films during exposure, nor shall any individual be regularly used for this service.
- (b) During each exposure, the operator shall stand at least 12 feet from the patient or behind a protective barrier.
  - (c) Only the patient shall be in the useful beam.
- (d) Neither the tube housing nor the pointer cone shall be hand-held during exposure.
  - (e) Fluoroscopy shall not be used in dental examinations.
- (f) Personnel monitoring shall be performed in controlled areas for each occupationally exposed individual beyond the required 13-week period, for whom there is a reasonable possibility of receiving a dose exceeding one-fourth the applicable maximum permissible dose. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

#### 37.14.1011 VETERINARY MEDICINE RADIOGRAPHIC INSTALLATIONS

- (1) The equipment used in veterinary medicine radiographic installations shall be as follows:
  - (a) The tube housing shall be of diagnostic type.
- (b) Diaphragms or cones shall be provided for collimating the useful beam to the area of clinical interest and shall provide the same degree of protection as is required of the housing. X-ray equipment acquired after July 1, 1980, shall be equipped with a variable rectangular collimator fitted with a light field that defines the entire area covered by the beam.
- (c) Except when contraindicated for a particular radiographic purpose, the total filtration permanently in the useful beam shall not be less than 1.5 millimeters aluminum-equivalent for machines capable of operating up to no more than 70 kVp and 2.5 millimeters aluminum-equivalent for machines capable of operating in excess of 70 kVp.
- (d) A device shall be provided to terminate the exposure after a preset time or exposure.

- (e) A type of dead-man switch for an exposure switch shall be provided, together with an electrical cord of sufficient length so that the operator can stand out of the useful beam and at least 6 feet from the animal during all x-ray exposures.
- (2) All wall, ceiling, and floor areas shall be equivalent to or provided with applicable protective barriers or shielding as required in ARM 37.14.705, 37.14.708, and 37.14.709.
- (3) The operating procedures applicable to veterinary medicine radiographic installations shall be as follows:
- (a) The operator shall stand at least 6 feet from the tube housing and the animal during radiographic exposures. Provisions shall be made so that the operator will not be required to stand in the useful beam.
  - (b) Hand-held fluoroscopic screens shall not be used.
  - (c) The tube housing shall not be held by the operator.
- (d) No individual other than the operator shall be in the x-ray room while exposures are being made unless such individual's assistance is required.
- (e) In any application in which the operator or other assisting individual is not located behind a protective barrier, clothing consisting of a protective apron having a lead-equivalent of not less than 0.5 millimeter shall be worn by the operator and any other individuals in the room during exposure.
- (f) No individual shall be regularly employed to hold or support animals, or hold film during radiation exposures. Operating personnel shall not perform this service except in cases in which no other method is available. Any individual holding or supporting an animal during radiation exposure shall wear protective gloves and apron having a lead-equivalent of not less than 0.5 millimeter.
- (g) Personnel monitoring shall be performed in controlled areas for each occupationally exposed individual beyond the required 13-week period, for whom there is a reasonable possibility of receiving a dose exceeding one-fourth the applicable maximum permissible dose. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1012 RADIOGRAPHIC INSTALLATIONS OTHER THAN DENTAL AND VETERINARY MEDICINE (1) The equipment used in radiographic installations in other than dental and veterinary medicine shall be as follows:
  - (a) The tube housing will be of diagnostic type.
- (b) Suitable devices (diaphragms, cones, adjustable collimators), capable of restricting the useful beam to the area of clinical interest shall be provided to define the beam and shall provide the same degree of attenuation as that required of the tube housing. Such devices shall be calibrated in terms of the size of the projected useful beam at specified source-film distances. For chest photofluorographic equipment, the collimator shall restrict the beam to dimensions no greater than those of the fluorographic screen and shall confine the beam to the screen.
- (c) Radiographic equipment, including multipurpose machines sold in Montana after July 1, 1969, shall be equipped with adjustable rectangular collimators containing light localizers that define the entire field. Equipment installed prior to March 28, 1980, utilizing circular collimators which have met or will meet established standards will be acceptable. The field size indication on adjustable collimators shall be accurate with a tolerance not exceeding 1 inch for a source-film distance of 72 inches, the light field shall align with the x-ray field with the same degree of accuracy.
- (d) The size of the x-ray beam projected by fixed aperture cones and collimators, except those used for stereo-radiography, should not exceed the minimum dimensions of the x-ray film by more than 2 inches (1 inch border) for a source-film distance of 72 inches or 1 inch (1/2 inch border) for a source-film distance of 36 inches.
- (e) Except when contraindicated for a particular radiographic purpose, the aluminum equivalent of the total filtration in the primary beam shall not be less than 0.5 millimeters aluminum for machines capable of operating not over 50 kVp, 1.5 millimeters for those capable of operating between 50-70 kVp and 2.5 millimeters for those capable of operating above 70 kVp.
- (f) A device shall be provided which terminates the exposure at a preset time interval or exposure. The operator shall be able to terminate the exposure at any time.
- (g) A type of dead-man switch for an exposure switch, except for those used in conjunction with "spot-film", shall be required and so arranged that it cannot be operated outside a shielded area.
- (h) The control panel shall include a device such as a milliammeter or equivalent to give positive indication of the production of x-rays whenever the x-ray tube is energized.

- (i) The control panel shall include devices, (labeled control settings and/or meters) indicating the physical factors (such as kVp, mA, exposure time, or whether timing is automatic) used for the exposure.
- (j) Machines equipped with beryllium window x-ray tubes shall contain keyed filter interlock switches in the tube housing and suitable indication on the control panel of the added filter in the useful beam if the total filtration permanently in the useful beam is less than 0.5 mm aluminum equivalent. The total filtration permanently in the useful beam shall be clearly indicated on the tube housing.
- (k) Beryllium window x-ray tubes shall not be used on multipurpose radiographic equipment.
- (1) Gonadal shielding shall be used for the patient when appropriate.
- (m) When a patient must be held in position for radiography, mechanical supporting or restraining devices shall be used whenever possible. If the patient must be held by an individual, that individual shall be protected with appropriate shielding devices such as protective gloves and apron and he shall be so positioned that no part of his body will be struck by the useful beam and that his body is as far as possible from the edge of the useful beam.
- (n) Only persons whose presence is necessary shall be in the radiographic room during exposure. All such persons shall be protected.
- (2) The structural shielding of radiographic equipment in other than dental or veterinary medicine shall be as follows:
- (a) All wall, floor, and ceiling areas exposed to the useful beam shall have primary barriers. Primary barriers in walls shall extend to a minimum height of 84 inches above the floor.
- (b) Secondary barriers shall be provided in all wall, floor, and ceiling areas not having primary barriers or where the primary barrier requirements are lower than the secondary barrier requirements.
- (c) The operator's station at the control shall be behind a protective barrier, either in a separate room, in a protected booth, or behind a shield which will intercept the useful beam and any radiation which has been scattered only once.
- (d) A window of lead-equivalent glass equal to that required by the adjacent barrier or a mirror system shall be provided large enough and so placed that the operator can see the patient without having to leave the protected area during exposure.
- (3) The operating procedures applicable to radiographic installations other than in dental or veterinary medicine shall be as follows:

- (a) Personnel monitoring shall be performed in controlled areas for each occupationally exposed individual beyond the required 13-week period, for whom there is a reasonable possibility of receiving a dose exceeding one-fourth the applicable maximum permissible dose.
- (b) No individual occupationally exposed to radiation shall be permitted to hold patients during exposures except during emergencies, nor shall any individual be regularly used for this service.
- (c) Only individuals required for the radiographic procedure shall be in the radiographic room during exposure; and, except for the patient, no unprotected parts of their bodies shall be in the useful beam.
- (d) The useful beam shall be restricted to the area of clinical interest. (History: Sec. 75-3-201 and 75-3-202, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-201, 75-3-202 and 75-3-204, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)

Rules 13 through 19 reserved

- 37.14.1020 SPECIAL REQUIREMENTS FOR MOBILE DIAGNOSTIC RADIOGRAPHIC EQUIPMENT (1) The equipment used in mobile diagnostic radiography shall be as follows:
- (a) All requirements of ARM 37.14.1012(1) shall be satisfied except (g).
- (b) A type of dead-man switch for an exposure switch shall be provided, together with electrical cord of sufficient length so that the operator can stand at least 6 feet from the useful beam.
- (2) When a mobile unit is used routinely in 1 location, it shall be considered a fixed installation subject to the shielding requirements specified in ARM 37.14.1003(5) and 37.14.1012(2).
- (3) The operating procedures applicable to mobile diagnostic radiographic equipment are as follows:
  - (a) All provisions of ARM 37.14.1012(3) apply.
- (b) The target-to-skin distance shall not be less than 15 inches.
- (c) Personnel monitoring shall be required for all persons associated with the operation of mobile x-ray equipment.
- (d) Mobile x-ray equipment shall not be used for photofluoroscopy unless it meets the requirements for mobile fluoroscopes in ARM 37.14.1006.
- (e) The operator shall wear a protective apron or stand behind a suitable shield. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1021 SPECIAL REQUIREMENTS FOR CHEST PHOTOFLUOROGRAPHIC INSTALLATIONS (1) The equipment used in chest photofluorographic installations shall be as follows:
- All requirements of ARM 37.14.1012(1) shall (a) satisfied.
- (b) A collimator shall restrict the useful beam to the area of the photofluorographic screen.
- All requirements of ARM 37.14.1003(5) and 37.14.1012(2) concerning structural shielding satisfied.
- (3) The operating procedures applicable to photofluorographic installations shall be as follows:
- All requirements of ARM 37.14.1012(3) shall be (a) satisfied.
- (b) All individuals except the patient being examined shall be in shielded positions during exposures.
- Personnel monitoring shall be required for all individuals associated with the operation of the equipment. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1022 THERAPEUTIC X-RAY INSTALLATIONS (1) The equipment used in therapeutic x-ray installations shall be as follows:
- (a) The tube housing shall be of therapeutic type. Contact therapy machines shall meet the additional requirement that the leakage radiation at 2 inches from the surface of the housing not exceed 0.1 R/h.
- (b) Permanent diaphragms or cones used for collimating the useful beam shall afford the same degree of protection as the tube housing. Adjustable or removable beam-defining diaphragms or cones shall transmit not more than 5% of the useful beam obtained at the maximum possible kilovoltage and with maximum treatment filter.
- (c) The filter system shall be so arranged as to minimize the possibility of error in filter selection and alignment. The filter slot shall be so constructed that the radiation escaping through it does not produce an exposure exceeding 1 roentgen per hour at 1 meter, or, if the radiation from the slot is accessible to the patient, 30 roentgens per hour at 2 inches from the external opening. Each removable filter shall be marked with its thickness and material.
- (d) A filter indication system shall be used on all therapy machines using changeable filters. It shall indicate from the control panel the presence or absence of any filter and it shall be designed to permit easy recognition of the filter in place.
- (e) The x-ray tube shall be so mounted that it cannot turn or slide with respect to the aperture. A mark on the housing should show the location of the focal spot.
- (f) Means shall be provided to immobilize the tube housing during stationary portal treatment.
- (g) There shall be on the control panel an easily discernible indicator which will give positive information as to whether or not the x-ray tube is energized.
- (h) A suitable exposure control device shall be provided to terminate the exposure after a preset exposure or dose limit. It shall be designed to preserve its accumulated response in the event of equipment failure during patient treatment. If a timer is used, it should permit accurate presetting and determination of exposure times as short as 1 second.
- (i) Unless it is possible to bring the x-ray exposure rate to the prescribed value within 5 seconds after the x-ray "on" switch is energized, the tube housing on machines operating below 500 kVp shall be fitted with an "ON-OFF" shutter operated from the control panel and of lead equivalent not less than that of the tube housing. The "ON-OFF" positions of the shutter shall be indicated at the control panel.

- (j) Mechanical or electrical stops shall be provided on xray machines capable of operating at 150 kVp or above to insure that the useful beam is oriented only toward primary barriers.
- Interlocks shall be provided for x-ray therapy equipment capable of operating above 75 kVp so that when any door to the treatment room is opened, either the machine will be shut off automatically or the radiation level within the room will be reduced to an average of not more than 2 mR/hr and a maximum of 10 mR/hr at a distance of 1 meter in any direction from the source. After such a shutoff or reduction in exposure rate, it shall be possible to restore the machine to full operation only from the control panel.
- (1) The x-ray control circuit shall be so designed that it is not possible to energize the x-ray tube without resetting the x-ray "on" switch at the control panel.
- X-ray therapy machines shall be provided with a locking device to prevent unauthorized use.
- (n) When a beam interceptor is provided, it shall transmit not more than 0.1% of the useful beam under any operating conditions. It shall also reduce by the same factor the radiation scattered by the patient through an angle up to 30° from the central ray.
- (o) When the relationship between the beam interceptor and useful beam is not permanently fixed, mechanical or electrical stops shall be provided to insure that the beam is oriented only toward primary barriers.
- Special consideration shall be given to the safety (p) design of x-ray machines with electron beam extraction capability such as linear accelerators.
- Therapeutic x-ray machines shall be structurally shielded as follows:
- All wall, floor, and ceiling areas that can be struck by the useful beam, plus a border of 1 foot, shall be provided with primary protective barriers.
- All wall, floor, and ceiling areas that, because of restrictions in the orientation of the useful beam, cannot be struck by the useful beam shall be provided with secondary protective barriers.
- (c) With equipment capable of operation above 75 kVp, the control station shall be outside the treatment room.

- (3) The operating procedures applicable to therapeutic x-ray installations shall be as follows:
- (a) A radiation protection survey of all new installations and existing installations not previously surveyed shall be made by, or under the direction of, a qualified expert. A resurvey shall be made after every change in equipment, workload, or operating conditions which might significantly increase the probability of persons receiving more than the MPD. If, as a result of a radiation survey, supplementary shielding is installed, another survey shall be made in order to confirm the adequacy of the shielding after the modification.
- (b) The qualified expert shall report his findings in writing, including recommendations for any required corrective measures, to the person in charge of the installation, a copy of which shall be sent to the department. The report shall indicate if a further survey is necessary after corrections have been made.
- (c) The installation shall be operated in compliance with any limitations indicated by the protection survey.
- (d) An x-ray therapy machine shall be calibrated by a qualified expert before use for the treatment of patients.
- (e) X-ray therapy equipment capable of operating above 75 kVp shall not be operated routinely until the radiation safety of the installation has been established.
- (f) Both the control panel and the patient shall be kept under observation during exposure.
- (g) When a patient must be held in position for radiation therapy, mechanical supporting or restraining devices shall be used.
- (h) No person other than the patient shall be in the treatment room where the tube is operated at potentials exceeding 75 kVp.
- (i) If the x-ray tube of a contact therapy machine is hand-held during irradiation, the operator shall wear protective gloves and apron. A cap of at least 0.5 mm lead equivalent shall cover the aperture window of the tube housing of such apparatus when the apparatus is not being used.
- (j) Lead, lead rubber, lead foil, etc., used for limiting the field, shall not transmit more than 5% of the useful beam (see Table I).
- (k) Notwithstanding ARM 37.14.721, personnel monitoring shall be required for all persons who enter a controlled area. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

TABLE I Thickness of lead required to reduce useful beam to 5%\*

Beam Quality		Required Lead
	Half Value Layer	Thickness
<u>Potential</u>	millimeters	millimeters
60 kVp	1.2 Al	0.10
100 kVp	1.0 Al	0.16
100 kVp	2.0 Al	0.25
100 kVp	3.0 Al	0.35
140 kVp	0.5 Cu	0.7
200 kVp	1.0 Cu	1.0
250 kVp	3.0 Cu	1.7
400 kVp	4.0 Cu	2.3
1000 kVp	3.2 Pb	20.5
2000 kVp	6.0 Pb	43.0
2000 kVcp	14.5 Pb	63.0
3000 kVcp	16.2 Pb	70.0
6000 kV	17.0 Pb	74.0
8000 kV	15.5 Pb	67.0
Cobalt 60	10.4 Pb	47.0

<sup>\*</sup>Approximate values for broad beams. The third column refers to lead or to the required equivalent lead thickness of leadcontaining materials (e.g., lead, rubber, lead glass, etc.).

### Subchapter 11

Use of Sealed Radioactive Sources in the Healing Arts

37.14.1101 SCOPE (1) The provisions of this subchapter apply to all licensees who use sealed sources in the healing arts and are in addition to, and not in substitution for, other applicable provisions of this chapter. (History: Sec. 75-3-201, MCA; <u>IMP</u>, Sec. 75-3-201, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; <u>TRANS</u>, from DHES, 1996 MAR p. 433; <u>TRANS</u>, from DEQ, 2000 MAR p. 189.)

Rules 02 through 04 reserved

- 37.14.1105 INTERSTITIAL, INTRACAVITARY AND SUPERFICIAL APPLICATIONS (1) Sealed sources shall be accounted for, stored and transported as follows:
- (a) Except as otherwise specifically authorized by the department, each licensee shall provide accountability of sealed sources and shall keep a record of the issue and return of all sealed sources. A physical inventory shall be made at least every 6 months and a written record of the inventory maintained.
- (b) When not in use, sealed sources and applicators containing sealed sources shall be kept in a protective enclosure of such material and wall thickness as may be necessary to assure compliance with the provisions of ARM 37.14.705, 37.14.708 and 37.14.709.
- (2) Sealed sources shall be tested for leakage and contamination as follows:
- (a) All sealed sources with a half-life greater than 30 days and in any form other than gas shall be tested for leakage and/or contamination prior to initial use and at intervals not to exceed 6 months, unless otherwise specified. If there is reason to suspect that a sealed source might have been damaged, or might be leaking, it shall be tested for leakage before further use.
- (b) Leak tests shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample or, in the case of radium, the escape of radon at the rate of 0.001 microcurie per 24 hours. Any test conducted pursuant to (a) above which reveals the presence of 0.005 microcurie or more of removable contamination or, in the case of radium, the escape of radon at the rate of 0.001 microcurie or more per 24 hours, shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with applicable provisions of ARM Title 37, chapter 14, subchapter 7.
- (c) Leak test results shall be recorded in units of microcuries and maintained for inspection by the department.
  - (3) Radiation surveys shall be conducted as follows:
- (a) The maximum radiation level at a distance of 1 meter from the patient in whom brachytherapy sources have been inserted shall be determined by measurement or calculation. This radiation level shall be entered on the patient's chart and other signs as required under (4) of this rule.
- (b) The radiation levels in the patient's room and the surrounding area shall be determined, recorded, and maintained for inspection by the department.

- (4) Signs and records shall be maintained as follows:
- (a) In addition to the requirements of ARM 37.14.725, the bed, cubicle, or room of the hospital brachytherapy patient shall be marked with a sign indicating the presence of brachytherapy sources. This sign shall incorporate the radiation symbol and specify the radionuclide, the activity, date and the individual to contact for radiation safety instructions. The sign is not required provided the exception in ARM 37.14.726(2) is met.
- (b) The following information shall be included in the patient's chart:
- (i) the radionuclide administered, number of sources, activity in millicuries and time and date of administration;
- (ii) the exposure rate at 1 meter, the time the determination was made, and by whom;
  - (iii) the radiation symbol; and
- (iv) the precautionary instructions necessary to assure that the exposure of individuals does not exceed that permitted under ARM 37.14.705. (History: Sec. 75-3-201 and 75-3-202, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-201 and 75-3-202, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)
- 37.14.1106 TELETHERAPY (1) The equipment used in teletherapy shall be as follows:
- (a) The housing shall be so constructed that, at 1 meter from the source, the maximum exposure rate does not exceed 10 milliroentgens per hour when the beam control mechanism is in the "off" position. The average exposure rate measured at a representative number of points about the housing, each 1 meter from the source, shall not exceed 2 milliroentgens per hour.
- (b) For teletherapy equipment installed after the effective date of this chapter, the leakage radiation measured at 1 meter from the source when the beam control mechanism is in the "on" position shall not exceed 0.1% of the useful beam exposure rate.
- (c) Adjustable or removable beam-defining diaphragms shall allow transmission of not more than 5% of the useful beam.
- (d) The beam control mechanism shall be of a positive design capable of acting in any orientation of the housing for which it is designed to be used. In addition to an automatic closing device, the mechanism shall be designed so that it can be manually returned to the "off" position with a minimum risk of exposure.
- (e) The closing device shall be so designed as to return automatically to the "off" position in the event of any breakdown or interruption of the activating force and shall stay in the "off" position until activated from the control panel.

- When any door to the treatment room is opened, the beam control mechanism shall automatically and rapidly restore the unit to the "off" position and cause it to remain there until the unit is reactivated from the control panel.
- (g) There shall be at the housing and at the control panel a warning device that plainly indicates whether the beam is "on" or "off".
- (h) The equipment shall be provided with a locking device to prevent unauthorized use.
- (i) The control panel shall be provided with a timer that automatically terminates the exposure after a preset time.
- Provision shall be made to permit continuous observation of patients during irradiation.
- No individual shall be in the treatment room during irradiation unless that individual is the patient. Mechanical restraining or supporting devices shall be used for positioning the patient, if necessary.
- Teletherapy sources shall be tested for leakage and contamination in accordance with the procedures described in ARM 37.14.1105(2). Tests of leakage may be made by wiping accessible surfaces of the housing port or collimator while the source is in the "off" position and measuring these wipes for transferred contamination. (History: Sec. 75-3-201 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Subchapter 12 reserved

# Radiation Safety Requirements for Analytical X-Ray Equipment

- 37.14.1301 SCOPE (1) This subchapter provides special requirements for analytical x-ray equipment which are in addition to the applicable requirements of other subchapters. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
  - <u>37.14.1302 DEFINITIONS</u> (1) As used in this subchapter:
- (a) "Analytical x-ray equipment" means equipment used for x-ray diffraction or fluorescence analysis.
- (b) "Analytical x-ray system" means a group of components utilizing x-rays to determine the elemental composition or to examine the microstructure of materials.
- (c) "Fail-safe characteristics" mean a design feature which causes beam port shutters to close, or otherwise prevents emergence of the primary beam, upon the failure of a safety or warning device.
- (d) "Local components" mean part of an analytical x-ray system and include areas that are struck by x-rays such as radiation source housings, port and shutter assemblies, collimators, sample holders, cameras, goniometers, detectors and shielding, but do not include power supplies, transformers, amplifiers, readout devices, and control panels.
- (e) "Normal operating procedures" mean step-by-step instructions necessary to accomplish the analysis. These procedures shall include sample insertion and manipulation, equipment alignment, routine maintenance by the registrant, and data recording procedures, which are related to radiation safety.
- (f) "Open-beam configuration" means an analytical x-ray system in which an individual could accidentally place some part of his body in the primary beam path during normal operation.
- (g) "Primary beam" means radiation which passes through an aperture of the source housing by a direct path from the x-ray tube or a radioactive source located in the radiation source housing. (History: Sec. 75-3-201, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-201, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)

Rules 03 and 04 reserved

- 37.14.1305 EQUIPMENT REQUIREMENTS (1) A safety device which prevents the entry of any portion of an individual's body into the primary x-ray beam path or which causes the beam to be shut off upon entry into its path shall be provided on all openbeam configurations.
- (a) A registrant may apply to the department for an exemption from this requirement for a safety device. Such application shall include:
- (i) a description of the various safety devices that have been evaluated;
- (ii) the reason each of these devices cannot be used; and (iii) a description of the alternative methods that will be employed to minimize the possibility of an accidental exposure, including procedures to assure that operators and others in the area will be informed of the absence of safety devices.
- (2) Analytical x-ray equipment shall be equipped with the following warning devices:
- (a) Open-beam configurations shall be provided with a readily discernible warning device which shall indicate:
- (i) whether the x-ray tube is on or off, and which shall be located near the radiation source housing, if the primary beam is controlled in this manner; or
- (ii) whether the shutter is open or closed, and which shall be located near each port on the radiation source housing, if the primary beam is controlled in this manner;
- (b) Warning devices shall be labeled so that their purpose is easily identified. On equipment installed after July 1, 1980, warning devices shall have fail-safe characteristics.
- (3) Unused ports on radiation source housings shall be secured in the closed position in a manner which will prevent casual opening.
- (4) All analytical x-ray equipment shall be labeled with a readily discernible sign or signs bearing the radiation symbol and the words:
- (a) "CAUTION--HIGH INTENSITY X-RAY BEAM", or words having a similar intent, on the x-ray source housing; and
- (b) "CAUTION--RADIATION--THIS EQUIPMENT PRODUCES RADIATION WHEN ENERGIZED", or words having a similar intent, near any switch that energizes an x-ray tube if the radiation source is an x-ray tube; or
- (c) "CAUTION--RADIOACTIVE MATERIAL", or words having a similar intent, on the source housing if the radiation source is a radionuclide.
- (5) On open-beam configurations installed after July 1, 1980, each port on the radiation source housing shall be equipped with a shutter that cannot be opened unless a collimator or a coupling has been connected to the port.

- (6) An easily visible warning light labeled with the words "X-RAY ON", or words having a similar intent, shall be located near any switch that energizes an x-ray tube and shall be illuminated only when the tube is energized; or in the case of a radioactive source, near any switch that opens a housing shutter, and shall be illuminated only when the shutter is open. On equipment installed after July 1, 1980, warning lights shall have fail-safe characteristics.
- Each x-ray tube housing shall be so constructed that, with all shutters closed, the leakage radiation measured at a distance of 5 cm from its surface is not capable of producing a dose in excess of 2.5 mrem in 1 hour at any specified tube rating; and if radioactive sources are used, corresponding dose limits shall not exceed 2 mR per hour.
- (8) Each x-ray generator shall be supplied with a protective cabinet which limits leakage radiation measured at a distance of 5 cm from its surface such that it is not capable of producing a dose in excess of 0.25 mrem in 1 hour. (History: Sec. 75-3-201 and 75-3-202, MCA; <u>IMP</u>, Sec. 75-3-201 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1306 AREA REQUIREMENTS (1) The local components of an analytical x-ray system shall be located and arranged and shall include sufficient shielding or access control such that no radiation levels exist in any area surrounding the local component group which could result in a dose to an individual present therein in excess of the dose limits given in ARM For systems utilizing x-ray tubes, these levels 37.14.709. shall be met at any specified tube rating.
- (2) Radiation surveys, as required by ARM 37.14.720, shall be performed of all analytical x-ray systems sufficient to show compliance with (1) of this rule unless a registrant can demonstrate to the satisfaction of the department compliance in some other manner. These surveys shall be performed:
- upon installation of the equipment, and at least once (a) every 12 months thereafter;
- following any change in the initial arrangement, number, or type of local components in the system;
- (c) following any maintenance requiring the disassembly or removal of a local component in the system;
- during the performance of maintenance and alignment procedures if the procedures require the presence of a primary beam when any local component in the system is disassembled or removed;
- any time a visual inspection of the local components in the system reveals an abnormal condition; and

- (f) whenever personnel monitoring devices show a significant increase over the previous monitoring period or the readings are approaching the limits specified in ARM 37.14.705.
- (3) Each area or room containing analytical x-ray equipment shall be conspicuously posted with a sign or signs bearing the radiation symbol and the words "CAUTION--X-RAY EQUIPMENT", or words having a similar intent. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1307 OPERATING REQUIREMENTS (1) Normal operating procedures shall be written and made available to all analytical x-ray equipment workers. No person shall be permitted to operate analytical x-ray equipment in any manner other than that specified in the procedures unless such person has obtained written approval of the radiation safety officer.
- (2) No person shall bypass a safety device unless such person has obtained the approval of the radiation safety officer. Such approval, if given, shall be for a specified period of time. When a safety device has been bypassed, a readily discernible sign bearing the words "SAFETY DEVICE NOT WORKING", or words having a similar intent, shall be placed on the radiation source housing. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, 75-3-201 and 75-3-202, MCA; IMP, 75-3-201 and 75-3-202, MCA; IMP, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 681; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1308 PERSONNEL REQUIREMENTS (1) No person shall be permitted to operate or maintain analytical x-ray equipment unless such person has received instruction in and demonstrated competence as to:
- (a) identification of radiation hazards associated with the use of the equipment;
- (b) significance of the various radiation warning and safety devices incorporated into the equipment, or the reasons they have not been installed on certain pieces of equipment and the extra precautions required in such cases;
  - (c) proper operating procedures for the equipment;
  - (d) symptoms of an acute localized exposure; and
- (e) proper procedures for reporting an actual or suspected exposure.
- (2) Finger or wrist dosimetric devices shall be provided to and shall be used by:
- (a) analytical x-ray equipment workers using systems having an open-beam configuration and not equipped with a safety device; and
- (b) personnel maintaining analytical x-ray equipment if the maintenance procedures require the presence of a primary x-ray beam when any local component in the analytical x-ray system is disassembled or removed.
- (3) Reported dose values shall not be used for the purpose of determining compliance with ARM 37.14.705 unless evaluated by a qualified expert. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 681; TRANS, from DEQ, 2000 MAR p. 189.)

### Radiation Safety Requirements for Particle Accelerators

37.14.1401 PURPOSE (1) This subchapter establishes procedures for the registration and the use of particle In addition to the requirements of this accelerators. subchapter, all registrants are subject to the requirements of ARM Title 37, chapter 14, subchapters 1, 3, 7, and 17. Registrants engaged in industrial radiographic operations are subject to the requirements of ARM Title 37, chapter 14, subchapter 8, and registrants engaged in the healing arts are subject to the requirements of ARM Title 37, chapter 14, subchapters 10 and 11. Registrants engaged in the production of radioactive material are subject to the requirements of ARM Title 37, chapter 14, subchapter 5. (History: Sec. 75-3-201 and 75-3-202, MCA;  $\underline{IMP}$ , Sec. 75-3-201 and 75-3-202, MCA;  $\underline{NEW}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{TRANS}$ , from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 02 through 04 reserved

#### 37.14.1405 REGISTRATION PROCEDURES AND REQUIREMENTS

- (1) No person shall receive, possess, use, transfer, own, or acquire a particle accelerator except as authorized in a registration issued pursuant to this chapter or as otherwise provided for in this chapter. The general procedures for registration of particle accelerator facilities are included in ARM Title 37, chapter 14, subchapter 3. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1406 GENERAL REGISTRATION PROCEDURE AND REQUIREMENTS: HUMAN USE OF PARTICLE ACCELERATORS (1) In addition to the requirements of ARM Title 37, chapter 14, subchapter 3, a registration application for use of a particle accelerator will be approved only if the department determines that:
- (a) the applicant is qualified by reason of training and experience to use the accelerator in question for the purpose requested in accordance with this subchapter and ARM Title 37, chapter 14, subchapters 7 and 17, in such a manner as to minimize danger to public health and safety or property;
- (b) the applicant's proposed or existing equipment, facilities, operating and emergency procedures are adequate to protect health and minimize danger to public health and safety or property;
- (c) the issuance of the registration will not be inimical to the health or safety of the public, and the applicant satisfies any applicable special requirement in ARM 37.14.1407;
- (d) the applicant has appointed a radiation safety officer;
- (e) the applicant or the applicant's staff has substantial experience in the use of particle accelerators and training sufficient for application to its intended uses;
- (f) the applicant has established a radiation safety committee to approve, in advance, proposals for uses of particle accelerators, whenever deemed necessary by the department; and
- (g) the applicant has an adequate training program for operators of particle accelerators. (History: Sec. 75-3-202, MCA;  $\underline{\text{IMP}}$ , Sec. 75-3-202, MCA;  $\underline{\text{NEW}}$ , 1980 MAR p. 1069, Eff. 3/28/80;  $\underline{\text{TRANS}}$ , from DHES, 1996 MAR p. 433;  $\underline{\text{TRANS}}$ , from DEQ, 2000 MAR p. 189.)

- 37.14.1407 REGISTRATION PROCEDURE: HUMAN USE OF PARTICLE ACCELERATORS (1) In addition to the requirements set forth in ARM Title 37, chapter 14, subchapter 3, a registration for use of a particle accelerator in the healing arts will be issued only if:
- (a) the applicant has appointed a medical committee of at least 3 members to evaluate all proposals for research, diagnostic, and therapeutic use of a particle accelerator whenever deemed necessary by the department. Membership of the committee should include physicians expert in internal medicine, hematology, therapeutic radiology, and a person experienced in depth dose calculations and protection against radiation;
- (b) the individual designated on the application as the users have substantial training and experience in deep therapy techniques or in the use of particle accelerators to treat humans; and
- (c) the individual designated on the application as the user is a physician. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 08 through 14 reserved

- 37.14.1415 COMPLIANCE (1) The registrant shall be responsible for assuring that all requirements of this subchapter are met. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1416 LIMITATIONS (1) No registrant shall permit any person to act as an operator of a particle accelerator until such person:
- (a) has been instructed in radiation safety and shall have demonstrated an understanding thereof;
- (b) has received copies of and instruction in this subchapter and the applicable requirements of subchapters 7 and 17, pertinent registration conditions and the registrant's operating and emergency procedures, and shall have demonstrated understanding thereof; and
- (c) has demonstrated competence to use the particle accelerator, related equipment, and survey instruments which will be employed in his assignment.
- (2) Either the radiation safety committee or the radiation safety officer shall have the authority to terminate the operations at a particle accelerator facility if such action is deemed necessary to protect health and minimize danger to public health and safety or property. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### 37.14.1417 SHIELDING AND SAFETY DESIGN REQUIREMENTS

- (1) A qualified expert, specifically accepted by the department, shall be consulted in the design of a particle accelerator installation and called upon to perform a radiation survey when the accelerator is first capable of producing radiation.
- (2) Each particle accelerator installation shall be provided with such primary or secondary barriers as are necessary to assure compliance with ARM 37.14.705 and 37.14.709. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1418 PARTICLE ACCELERATOR CONTROLS AND INTERLOCK SYSTEMS (1) Instrumentation, readouts and controls on the particle accelerator control console shall be clearly identified and easily discernible.
- (2) All entrances into a target room or other high radiation area shall be provided with interlocks that shut down the machine under conditions of barrier penetration.
- (3) When an interlock system has been tripped, it shall only be possible to resume operation of the accelerator by manually resetting controls at the position where the interlock has been tripped, and lastly at the main control console.
- (4) Each safety interlock shall be on a circuit which shall allow its operation independently of all other safety interlocks.
- (5) All safety interlocks shall be designed so that any defect or component failure in the interlock system prevents operation of the accelerator.
- (6) A scram button or other emergency power cutoff switch shall be located and easily identifiable in all high radiation areas. Such a cutoff switch shall include a manual reset so that the accelerator cannot be restarted from the accelerator control console without resetting the cutoff switch. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 19 through 24 reserved

- 37.14.1425 WARNING DEVICES (1) All locations designated as high radiation areas, and entrances to such locations shall be equipped with easily observable flashing or rotating warning lights that operate when, and only when, radiation is being produced.
- (2) Except in facilities designed for human exposure, each high radiation area shall have an audible warning device which shall be activated for 15 seconds prior to the possible creation of such high radiation area. Such warning device shall be clearly discernible in all high radiation areas and all radiation areas.
- (3) Barriers, temporary or otherwise, and pathways leading to high radiation areas shall be identified in accordance with ARM 37.14.725. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1426 OPERATING PROCEDURES (1) Particle accelerators, when not in operation, shall be secured to prevent unauthorized use.
- (2) The safety interlock system shall not be used to turn off the accelerator beam except in an emergency.
- (3) All safety and warning devices, including interlocks, shall be checked for proper operability at intervals not to exceed 3 months. Results of such tests shall be maintained at the accelerator facility for inspection by the department.
- (4) Electrical circuit diagrams of the accelerator and the associated interlock systems shall be kept current and maintained for inspection by the department and shall be available to the operator at each accelerator facility.
- (5) If, for any reason, it is necessary to intentionally bypass a safety interlock or interlocks, such action shall be:
- (a) authorized by the radiation safety committee or radiation safety officer;
- (b) recorded in a permanent log and a notice posted at the accelerator control console; and
  - (c) terminated as soon as possible.
- (6) A copy of the current operating and the emergency procedures shall be maintained at the accelerator control panel. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 27 through 29 reserved

- 37.14.1430 RADIATION MONITORING REQUIREMENTS (1) There shall be available at each particle accelerator facility appropriate portable monitoring equipment which is operable and has been calibrated for the appropriate radiations being produced at the facility. Such equipment shall be tested for proper operation daily and calibrated at intervals not to exceed 1 year and after each servicing and repair.
- (2) A radiation protection survey shall be performed and documented by a qualified expert specifically approved by the department when changes have been made in shielding, operation, equipment, or occupancy of adjacent areas.
- (3) Radiation levels in all high radiation areas shall be continuously monitored. The monitoring devices shall be electrically independent of the accelerator control and interlock systems and capable of providing a remote and local readout with visual or audible alarms at both the control panel and at entrance to high radiation areas, and other appropriate locations, so that people entering or present become aware of the existence of the hazard.
- (4) All area monitors shall be calibrated at intervals not to exceed 1 year and after each servicing and repair.
- (5) Whenever applicable, periodic surveys shall be made to determine the amount of airborne particulate radioactivity present in areas of airborne hazards.
- (6) Whenever applicable, periodic smear surveys shall be made to determine the degree of contamination in target and other pertinent areas.
- (7) All area surveys shall be made in accordance with the written procedures established by a qualified expert or the radiation safety officer of the particle accelerator facility.
- (8) Records of all radiation protection surveys, calibration results, instrumentation tests, and smear results shall be kept current and on file at each accelerator facility. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201, 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1431 VENTILATION SYSTEMS (1) Means shall be provided to ensure that personnel entering any area where airborne radioactivity may be produced will not be exposed to airborne radioactive material in excess of those limits specified in ARM Title 37, chapter 14, subchapter 7, Appendix A, Table I.
- (2) A registrant, as required by ARM 37.14.709 shall not vent, release or otherwise discharge airborne radioactive material to an uncontrolled area which exceed the limits specified in ARM Title 37, chapter 14, subchapter 7, Appendix A, Table II, except as authorized pursuant to ARM 37.14.710(2) or 37.14.741. For purposes of this subsection, concentrations may be averaged over a period not greater than 1 year. Every reasonable effort should be made to maintain releases of radioactive material to uncontrolled areas as far below these limits as practicable. (History: Sec. 75-3-201 and 75-3-202 MCA; IMP, Sec. 75-3-201 And 75-3-202 MCA;

Subchapters 15 and 16 reserved

Notices, Instructions and Reports to Workers; Inspections

37.14.1701 PURPOSE AND SCOPE (1) This subchapter establishes requirements for notices, instructions and reports by licensees to individuals engaged in activities under a license and options available to such individuals in connection with department inspections of licensees to ascertain compliance with the provisions of the act and rules, orders and licenses issued thereunder regarding radiological working conditions. The sections in this subchapter apply to all persons who receive, possess, use, own or transfer sources of radiation licensed by the department pursuant to ARM Title 37, chapter 14, subchapters 3 and 5. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 02 through 04 reserved

- 37.14.1705 POSTING OF NOTICES TO WORKERS (1) Each licensee shall post current copies of the following documents:
  - (a) the rules of this subchapter and of subchapter 4;
- (b) the license, conditions or documents incorporated into the license by reference and amendments thereto;
- (c) the operating procedures applicable to activities under the license; and
- (d) any notice of violation involving radiological working conditions, proposed imposition of civil penalty, or order issued pursuant to ARM Title 37, chapter 14, subchapter 1, and any response from the licensee.
- (2) If posting of a document specified in (1)(a), (b) or (c) of this rule is not practicable, the licensee may post a notice which describes the document and states where it may be examined.
- (3) Form MRH-20, "Notice to Employees", shall be posted by each licensee.
- (4) Department documents posted pursuant to (1)(d) of this rule shall be posted within 5 working days after receipt of the documents from the department; the licensee's response, if any, shall be posted within 5 working days after dispatch from the licensee or registrant. Such documents shall remain posted for a minimum of 5 working days or until action correcting the violation has been completed, whichever is later.
- (5) Documents, notices or forms posted pursuant to this rule shall appear in a sufficient number of places to permit individuals engaged in work under the license to observe them on the way to or from any particular work location to which the document applies, shall be conspicuous, and shall be replaced if defaced or altered. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

- 37.14.1706 INSTRUCTIONS TO WORKERS (1) All individuals working in or frequenting any portion of a restricted area:
- (a) shall be kept informed of the storage, transfer, or use of sources of radiation in such portions of the restricted area;
- (b) shall be instructed in the health protection problems associated with exposure to radiation or radioactive material, in precautions or procedures to minimize exposure, and in the purposes and functions of protective devices employed;
- (c) shall be instructed in, and instructed to observe, to the extent within the worker's control, the applicable provisions of this chapter and licenses for the protection of personnel from exposure to radiation or radioactive material occurring in such areas;
- (d) shall be instructed of their responsibility to report promptly to the licensee or registrant any condition which may lead to or cause a violation of the act, this chapter, and licenses or unnecessary exposure to radiation or radioactive material;
- (e) shall be instructed in the appropriate response to warnings made in the event of any unusual occurrence or malfunction that may involve exposure to radiation or radioactive material; and
- (f) shall be advised as to the radiation exposure reports which workers shall be furnished pursuant to ARM 37.14.1707.
- (2) The extent of these instructions shall be commensurate with potential radiological health protection problems in the restricted area. (History: Sec. 75-3-201 and 75-3-202, MCA; IMP, Sec. 75-3-201 and 75-3-202, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

#### 37.14.1707 NOTIFICATIONS AND REPORTS TO INDIVIDUALS

- (1) Radiation exposure data for an individual and the results of any measurements, analyses, and calculations of radioactive material deposited or retained in the body of an individual shall be reported to the individual as specified in this rule. The information reported shall include data and results obtained pursuant to this chapter, orders, or license conditions, as shown in records maintained by the licensee or registrant pursuant to this chapter. Each notification and report shall:
  - (a) be in writing;
- (b) include appropriate identifying data such as the name of the licensee or registrant, the name of the individual, and the individual's social security number;
  - (c) include the individual's exposure information; and
- (d) contain the following statement: "This report is furnished to you under the provisions of the Montana Radiation Control Act, ARM Title 37, chapter 14, subchapter 17. You should preserve this report for further reference".
- (2) Each licensee or registrant shall advise each worker annually of the worker's exposure to radiation or radioactive material as shown in records maintained by the licensee or registrant pursuant to ARM 37.14.750(1) and (3).
- (3) Each licensee or registrant shall furnish to each worker a report of the worker's exposure to radiation or radioactive material upon termination of employment. Such report shall be furnished within 30 days from the time of termination of employment or within 30 days after the exposure of the individual has been determined by the licensee or registrant, whichever is later. The report shall cover each calendar quarter in which the worker's activities involved exposure to sources of radiation and shall include the dates and locations of work under the license or registration in which the worker participated.
- (4) When a licensee or registrant is required pursuant to ARM 37.14.756 to report to the department any exposure of an individual to radiation or radioactive material, the licensee or the registrant shall also provide the individual a report on the exposure data included therein. Such reports shall be transmitted at a time not later than the transmittal to the department. (History: Sec. 75-3-202 and 75-3-204, MCA; IMP, Sec. 75-3-202 and 75-3-204, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 08 through 19 reserved

37.14.1720 INSPECTION PROCEDURES (1) Each licensee or registrant shall afford to the department at all reasonable times the opportunity to inspect materials, machines, activities, facilities, premises and records pursuant to this chapter. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-107, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### 37.14.1721 CONSULTATION WITH WORKERS DURING INSPECTIONS

- (1) Agency inspectors may consult privately with workers concerning matters of occupational radiation protection and other matters related to applicable provisions of this chapter and licenses to the extent the inspectors deem necessary for the conduct of an effective and thorough inspection.
- (2) During the course of an inspection, any worker may bring privately to the attention of the inspectors, either orally or in writing, any past or present condition which he has reason to believe may have contributed to or caused any violation of the act, this chapter, or license condition, or any unnecessary exposure of an individual to sources of radiation under the licensee's or registrant's control. (History: Sec. 75-3-202, MCA; IMP, Sec. 75-3-107, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

### Stabilization of Mill Tailings Piles

37.14.1801 SCOPE (1) The provisions of this subchapter apply to mining, milling or manufacturing operations where wastes, tailings piles, or stockpiled ore which contain radioactive material have accumulated. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Rules 02 through 04 reserved

- 37.14.1805 PERMISSIBLE CONCENTRATIONS AND LEVELS OF RADIATION (1) All wastes, tailings, or stockpiled ore containing radioactive material from active or inactive mining, milling, or manufacturing operations shall be kept and maintained in such a manner as not to release to an unrestricted area radioactive material in concentrations which exceed the limits specified in ARM Title 37, chapter 14, subchapter 7, Appendix A, Table II. Permissible levels of radiation in restricted and unrestricted areas are stated in ARM 37.14.705 and 37.14.709. (History: Sec. 75-3-201, MCA; IMP, Sec. 75-3-201, MCA; NEW, 1980 MAR p. 1069, Eff. 3/28/80; TRANS, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)
- 37.14.1806 STABILIZATION OF TAILINGS PILES AND PONDS FROM MILLS (1) Ponds from inactive mills shall be drained and covered with materials or provided with vegetative cover that will prevent wind and water erosion. Water drained from ponds from inactive mills shall be disposed of in a manner approved by the department.
- (2) Taking into consideration the types of materials at each site, piles from inactive mills shall be leveled and graded so that there is, insofar as possible, a gradual slope to ensure that there shall be no low places on the pile where water might collect. Side slopes shall be stabilized by riprap, dikes, reduction of grades, vegetation, or any other method or combination of methods that will ensure stabilization.
- (3) If pile edges from inactive mills are adjacent to a river, creek, gulch, or other watercourse that might reasonably be expected to erode the edges during periods of high water, the exposed slopes shall be stabilized and the edges shall be diked and riprapped sufficiently to prevent erosion of the pile.
- (4) Adequate drainage ditches shall be provided around the pile edges from inactive mills to prevent surface runoff water from neighboring land from reaching and eroding the pile.
- (5) Piles shall be stabilized against wind and water erosion. The method of stabilization may consist of vegetation or a cover of soil, soil containing rock or stone, cement or concrete products, petroleum products, or any other soil stabilization material presently recognized or which may be recognized in the future, or any combination of the foregoing as may be required for proper protection from wind, or water erosion.
- (6) Access to a stabilized pile area shall be controlled by the operator or owner and properly posted.
- (7) Active and inactive piles shall be maintained in such a manner that excessive erosion of, or environmental hazard from, radioactive materials does not occur.

- The owner of a tailings pile site shall give the (8) department written notice 10 days in advance of any contemplated transfer of right, title or interest in such site by deed, lease, or other conveyance. The written notice shall contain the name and address of the proposed purchaser or transferee. Prior written approval of the department shall be obtained before the surface area of the land shall be put to use and it shall have been determined that the radiation dosage to the public resulting from the proposed use does not exceed 0.5 rem per year.
- (9) With the exception of use at a mill or reprocessing at the site or another location, prior written approval of the department must be obtained before any tailing material is removed from any active or inactive mill.
- Detailed plans for stabilizing tailings piles shall be submitted to the department for review and approval prior to undertaking stabilization of the pile.
- The department may waive individual requirements in regard to stabilization or utilization of tailings material if it can be shown that they are unnecessary or impracticable in specific cases. (History: Sec. 75-3-201, MCA; <u>IMP</u>, Sec. 75-3-201, MCA; <u>NEW</u>, 1980 MAR p. 1069, Eff. 3/28/80; <u>TRANS</u>, from DHES, 1996 MAR p. 433; TRANS, from DEQ, 2000 MAR p. 189.)

Chapters 15 through 24 reserved